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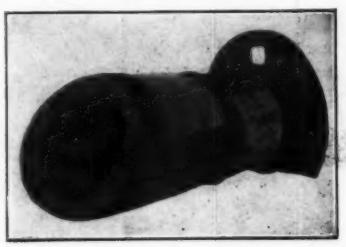

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Vol. CVI, No. 27 NEW YORK, JUNE 30, 1917 Whole No. 3095

The Use of Gas in the Preservation of Foodstuffs

Canning, Drying, Dehydrating, Desiccating, Chemical Preservation, Cooking, Heating, Smoking, Refrigerating, Extracting and Concentrating— Gas Plays Important Part

By GILBERT C. SHADWELL

In the same way that it is inherent in man to save money for " a rainy day " so it is to store up food when it is plentiful for the time when scarcity will exist.

Exactly as necessity prompted the hunter in olden days to accumulate his surplus food for the hard times to follow so it behooves us at this critical time to preserve what we can for future use.

In all of this enormous work gas as a heating medium plays a vastly important part. It is therefore eminently desirable that some short outline be given as to different methods of preserving the various kinds of foodstuffs.

Country Leads in Canning for Food Preservation

Although the United States as a country has probably been paramount in canning and other forms of food preservation in years past—both in the home and in the factory—the home preserved products have almost invariably been restricted to small quantities and few products.

Moreover, much edible material in past years has been allowed to go to waste and to rot. This year nothing must be wasted, nothing allowed to spoil that can be stored for use during the unproductive months to come.

I suppose there is hardly a person in this country who has not some idea of one or other of the ways of preserving foodstuffs of some kind or another. The general methods may be classified broadly as follows:

(a) Canning.
(b) Drying, dehydrating or desiccating.
(c) Chemical preservation (including salting).
(d) Cooking or heating.
(e) Smoking.
(f) Refrigerating.
(g) Extracting or concentrating.

All of these methods are connected one with another in one or more ways. That is to say, fungoid organisms may be killed by chemicals or their growth and increase may be stopped by cold, removal of water or by the presence of agents which arrest their growth while not necessarily destroying their life.

All successful processes of food preservations depend on one or other of these circumstances.

An important point which should be borne in mind is that at 212 deg. Fahr. all living cells perish, but some bacteria spores may survive for as long as two or even three hours. Still, few fully developed bacteria can live beyond 165 deg. Fahr. when in the damp or liquid state or beyond 280 to 290 deg. Fahr. when in dry heat. Then again such life is destroyed much more easily in solutions which are of an acid nature than those which are alkaline. This supplies the answer as to why jams, jellies and other " preserves " are so much easier to keep than other products.

Raw meat, raw milk—raw anything will " go bad " easily. Cook it and it will tend to keep far longer. If after it is thoroughly cooked it is properly kept from outside influences, in fact, properly canned it will keep almost indefinitely.

Important Part Gas Plays

I do not have to lay any emphasis on how big a part gas can play in such work. No explanation is necessary. The opportunity is right here. No gas man can fail to see it.

In canning, therefore, the chief point to be remembered is that all bacteria must be destroyed and proper provision made to prevent any fresh crop entering the material after it has been packed. Do not forget that our hands, the air—in fact almost everything that surrounds us is septic; that is to say laden with bacteria or unsterilized.

There are numerous ways of packing or canning, but the principle is, generally speaking, the same whatever the product. Peas, spinach, beans, carrots—all vegetables—are best canned by what is usually termed the " cold pack " method. Roughly, it is as follows:

The product is washed to free it from dirt. It is then placed in a square piece of cheese-cloth—large enough to allow the four corners to be picked up with the contents about 6 in. from the corners.

The cloth with its contents are then steamed or

bleached in live steam from a "cooker" or saucepan (depending on the quantity) from five to fifteen minutes.

The jar or "can" is meanwhile thoroughly heated to at least 212 deg. Fahr. and the product is packed into the jar after it has been quickly dipped into a bowl of cold water a few times. Parenthetically, I should emphasize the fact that the product must not be soaked in the cold water but merely dipped quickly up and down while still in the cheese-cloth.

OVEN FOR COMMERCIAL DRYING

When placed in the can or jar it should be packed down as tightly as possible and as quickly as possible, not allowing the container to cool off. When thoroughly packed, boiling water should be added together with one level teaspoon per quart of contents of salt. The cap and rubber should then be put on (not tight) and the jar should be sterilized for about 90 to 100 minutes or more, depending on the nature of the vegetable. After this it may be completely closed, then wrapped in paper and stored.

With fruits the same thing applies, but in place of adding boiling water, hot sugar syrup should be added. The best sugar syrup for most fruits is one having a density of about 40 to 50 deg., but certain other fruits may be preserved with far tighter syrups.

All of the heating work demands gas for fuel. It is so easily controlled that it will easily hold first place among all other fuels wherever it can be had.

Preserving by Drying

The canning of foodstuffs is important. It may be applied to every kind of vegetable, every kind of fruit and every kind of meat. Tomatoes may be canned in the same way as vegetables, but no water should be added for the reason that a tomato has already in it about 94 per cent of water, or in other words only about 6 per cent of solid matter. Chicken may also be canned but it demands another modification. It should be dissected so that all of the digestive organs may be removed *whole*, so as not to allow any contamination to be imparted to the flesh.

A sharp knife run down the bird will accomplish this and if a little thought and care are observed the proposition will be easy. The legs, parts of wings, etc., may then be removed and packed as with vegetables and the only difference in cooking or sterilizing will be in the length of time required.

In this case we need 2½ to 3 hours, or if we use a pressure steamer the time may be reduced to 45 to 60 minutes.

There are so many publications on this subject especially as to home canning that the reader should make himself familiar with the exact details as regards the individual treatment of each type of food product. All that I have attempted to give are the general principles involved. They are practically the same throughout and if carefully followed will make the various modifications easily understood.

In commercial practice the can which has been made of tin plate is packed with the material to be preserved and a little water having been added to completely fill it up, the lid is secured by soldering or seaming or both.

Sterilization is effected by placing the cans in pressure chambers which are heated by steam to 250 deg. Fahr., or even higher.

The cans are exposed to this temperature for that length of time necessary to heat the contents to at least 212 deg. Fahr. The temperature is then allowed to fall slowly to below 212 deg. Fahr. when the cans are removed, placed in water and heated until cooked. In some cases a hole is left in the lid to allow any surplus air to escape. Such holes are closed by means of a drop of solder before cooling.

Important as is the subject of canning that of preserving by drying is almost equally so. Dried foods are not only easily preserved, but the fact that their bulk is often only about 5 or 10 per cent of their former size makes their handling or transportation a very simple matter.

It is a generally established fact that food materials in which the percentage of moisture is small (usually not over 5 to 10 per cent) are but little liable to bacteria growths. Nature preserves the germs in seeds and nuts which are laden with otherwise decomposable material by the simple expedient of water removal.

Reduction in Bulk

In life of cereal grains, etc., many seeds appear to be unlimited; in fact, some seeds found in ancient earthenware vessels in Egypt which have lain there for several thousand years appear almost entirely unharmed.

Four thousand pounds of sweet potatoes may readily be dried to 400 or 500 lb. The drying of vegetables and fruits can be accomplished either by a blower (a small electric fan can be used in domestic work) or by heat or a combination of both.

In the first case the product may be placed on wire or wooden screens and air blown on to or through them. In the second case the product should be warmed to about 90 to 110 deg. Fahr. depending on its nature.

This can be done in small quantities by placing a cloth over a metal covered water pan heated on a gas burner and then resting the vegetables, etc., on the cloth. When dried so that they are "leathery" the products may have the temperature increased to 180 deg. or even 200 deg. Fahr.

This may be effected by removing the cloth and allowing the fruit, vegetables, etc., to rest right on the metal top so that they are heated directly from the water vapor or steam from the water in the pan.

Thus by the removal of water the most perishable materials such as peaches, meat, etc., can be rendered unchangeable except so far as the inevitable oxidation of the fatty substances contained in them is concerned and which is independent of life-action.

The drying of meat has become almost obsolete excepting for comparatively small articles such as ox tongues or tails, fish, etc. Fruit, however, is very

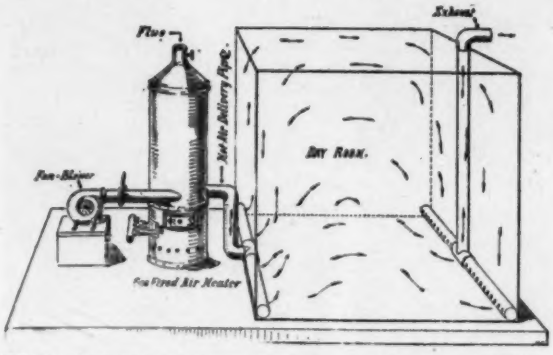

FIG. 2. SHOWING DELIVERY OF AIR THROUGH AIR-DUCTS

largely preserved in this way. Grapes are sundried and thus form currants, raisins and sultanas. Plums, apples and pears are dried as above described or in a manner indicated below. Also excellent preparations of dried vegetables, including potatoes, carrots, onions, beans, cabbages, etc., are similarly manufactured.

Gas-Fired Drying Oven

In commercial practice the drying is sometimes accomplished in an oven such as that shown in Fig. 1.

A more satisfactory method is a combination of heat and air in motion.

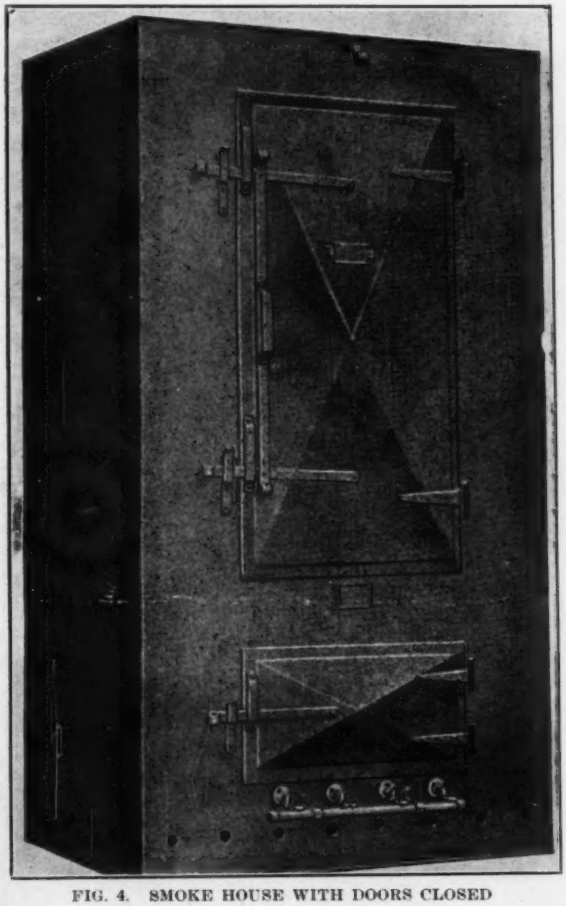

FIG. 4. SMOKE HOUSE WITH DOORS CLOSED

Wooden racks or screens are placed in a drying chamber such as is shown in Fig. 2 and air is delivered from a blower through a gas-fired air heater and into the drying chamber by means of the air-ducts shown.

In this way the temperature of the air is kept uniform at about 90 to 110 deg. Fahr, until the "leathery" state of the fruit or vegetable has been reached, after which the temperature if raised to about 150 to 200 deg. Fahr. and continued until drying is sufficiently completed. If the temperature be too high at the start the skin only will dry leaving the interior wet and preventing any of such inside moisture getting out. The

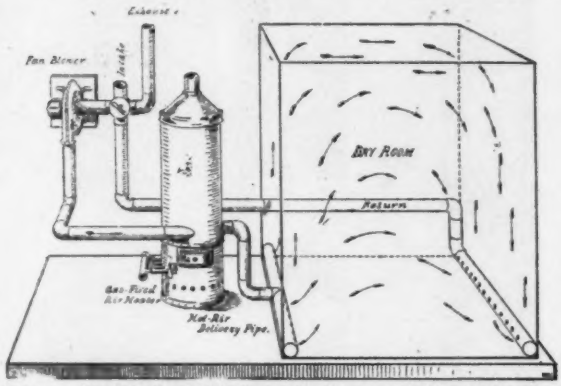

FIG. 3. RECIRCULATION METHOD USING BLOWER AND GAS-FIRED AIR HEATER

product so dried will not keep well and will spoil in a short while.

A better method for some fruits which do not contain a very high percentage of water is the recirculation method of using a blower and gas-fired air heater and is shown diagrammatically in Fig. 3.

Here, by means of a three-way damper it is possible to recirculate all the air or only a part of it as desired—allowing a certain amount of fresh air to be entrained with the "used" air. This maintains the relation humidity fairly constant and tends to prevent unevenness in drying.

The present article can hardly be concluded without reference being made to the drying and smoking of meats.

An air heater and blower is often used for the drying but is also accomplished in the smoke house, an example of which is shown in Fig. 4 and 5.

The following schedule is of use in connection with the above:

SMOKING AND COOKING SCHEDULE FOR DOMESTIC SAUSAGE

SAUSAGE Name of	SMOKING Hrs.	SMOKING Temp. F.	COOKING Hrs.	COOKING Temp. F.
Long Bologna	3	145–150	1/2	160
Large Bologna	3	145–150	2	160
Round Bologna	2	135–140	1/2	155
Bag Bologna	1	140–145	2	160
Bologna in weasands	4	185	3/4	155
Knoblauch	1–1 1/2	130	1/2	160
Leona Bologna, long	3	145	3/4	155
Leona Bologna, large	3	145	2	160
Frankfurts	2 1/2–3	130–135	1/10	160
Vienna Frankfurts	3	140–145	1/10	160
High grade Frankfurts	3–3 1/2	150–160	1/10	160
Tongue	12	65–70	2	200
Liver	1–1 1/2	110–120	1/2	160
Polish	3–3 1/2	150–160	†	...
Minced Ham	3–3 1/2	135	4	150
Berlin Ham	5	130–140	2	170
Cooked pressed Ham	5	130–140	2 1/2	180
Cottage Ham	32	120	†	...
Boneless Ham	48	120	†	...

† Not cooked.

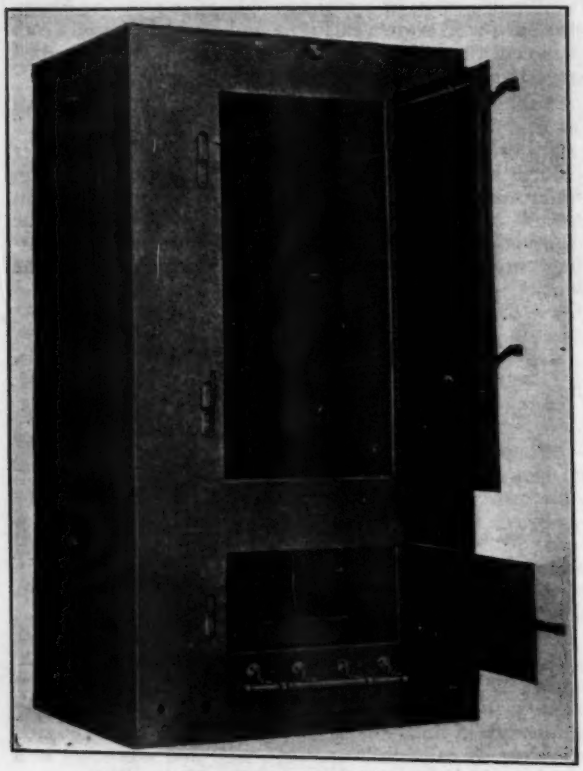

FIG. 5. INTERIOR VIEW OF SMOKE HOUSE

This smoke house is so designed that the smoke may be sent through the meats, or deflected into the flue at will. Sausage and meats may therefore be left hanging in the house without getting more smoke than necessary.

No smoke escapes into the room when the door is opened.

The smoke shutters over the saw-dust pan are operated by a bracket near the lower latch of the door. When the door is closed, the operation of pulling down the handle to close the latch forces this bracket down. This opens the shutters and permits the smoke to pass into the smoking chamber.

Opening the smoke house is acomplished without letting smoke into the room. When the handle of the door is partly raised the bracket rises with it. This closes the smoke shutters while, at the same time, it leaves the door fastened. The flue damper opens as the shutters close, thus sending all smoke from the generator directly into the chimney. The small draft door is then opened which admits air into the smoking compartment to blow out the smoke. One minute after this has been done the main smoke house door may be opened.

A strong wire screen is placed over the shutters. This prevents meats from dropping upon the shutters or into the saw-dust pan.

The generator compartment contains the saw-dust pan and gas burners. The latter are so designed as to give no smoke with a high heat, a heavy smoke with a low heat, or any stage between these two extremes. This is accomplished by having four burners; two under the pan, and two at the sides. The pan slides on runners so that it may be conveniently removed to dump the ashes.

Angle iron flanges along the sides of the smoke house supply supports for bars* on which to hang the meat.

A thermometer is an important adjunct to any smoke house where it is desired to do the best work, and where it is important to turn out uniform goods.

Smoke House Notes

Cured meats, after being soaked to remove surplus salt, should hang several hours until they stop dripping. The smoke house should then be warmed to about 115 deg. Fahr. so as to dry the surface of the meats until they have a glazed appearance. This will require several hours more. The outer or side burners may be used for this purpose as they do not heat the saw-dust pan. After the meats are thoroughly dried, the burners under the saw-dust pan should be lighted (using hardwood saw-dust) and the temperature, allowed to rise gradually to 118 deg. Fahr. in 10 or 12 hours. Sweet pickle meats should be smoked 24 to 36 hours. The meats should be allowed to cool off thoroughly with the ventilator open before removing them from the house. Meats should be handled as little as possible after smoking.

Boiled hams should soak at about 165 deg. Fahr. for two hours to remove surplus salt; they should then be cooked for 4 or 5 hours at 160 deg. Fahr. and allowed to cool in the water in which they are cooked so as to reabsorb some of the weight lost in cooking. They should then hang until the meat stops dripping and be dried thoroughly in the smoke house* at about 118 deg. Fahr. before smoking. They should then be smoked very lightly.

Hams shrink less if cooked before smoking than if cooked afterwards.

Dried beef should hang in the smoke house at 135 deg. Fahr. for 24 to 36 hours to dry thoroughly before smoking. Then the beef should be given a heavy smoke after which it should be cooled and allowed to hang for 24 hours before handling if possible.

"Puffy" meats result from smoking before the meat is thoroughly cured. In this case decomposition takes place when the heat is applied, and gases are produced in the meats.

Conclusion

Dried or smoked meats as a rule require but a relatively small amount of wrapping or packing, but dried fruits, etc., should be thoroughly sealed after drying so that no air may enter and contaminate the contents.

One point should not be forgotten. When the dried fruits, etc. are soaked prior to cooking, the same water used to soak them should also be used to cook them in.

This is a brief presentation of the subject but it is hoped that it will enable gas men and others to understand something of this all-important subject at this critical time.

Use of Producer Gas in Industries Increasing Rapidly

The use of producer gas in the industries has increased markedly in late years. In steel plants it is burned for many purposes, principally for heating metal. The gas is manufactured at the plant in large quantities and a considerable number of men are employed solely in its manufacture.

* Drying may also be accomplished by means of Air Heaters to save time, especially in the case of large batches of goods.

Any Increase in Amount of Trinitrotoluol Made Must Come from Toluol Produced by Gas Companies

W. H. Gartley Declares that It is not Unlikely that all Gas Companies in Cities of 75,000 Inhabitants or Over will have to Give Matter of Toluol Production Immediate Attention

There is no doubt that one of the most important points to be taken up by the Government officials at this time is the question of procuring a large quantity of materials from which to make high explosives, declared W. H. Gartley at the special meeting of the American Gas Institute, held in New York City, June 12. If Napoleon gained great fame by developing the artillery branch of the service beyond anything that had formerly been accomplished, it appears that this war from a military point of view will be historic on account of the enormous dependency that has been placed on high explosives.

It has developed in the last few weeks that there are demands for trinitrotoluol for which no substitute can be accepted. Picrates made from the benzols are recognized for certain grades and kinds of high explosive work, and in one form or another will be used to a very large extent, but the urgent demand at the present day would appear to be for trinitrotoluol.

Increase Must Come from Gas Companies

If there is to be any increase in the amount of trinitrotoluol made it must come from the toluol produced by the gas companies. All of the steel companies, with but one or two exceptions, that are now operating coke oven plants have in operation light oil recovery plants in connection therewith and are producing therefrom pure toluol so that there is no use in looking to the steel companies or to the coke oven plants for any large additional amount of toluol in the immediate future. It is true that the coke oven plants now under consideration and building will, within eight months to a year,—depending on the speed with which these coke oven plants can be erected and put into operation,—increase the output of toluol to some 14,000,000 gal. per year, but at the present time any increase above the 10,000,000 or 11,000,000 gal. must come from the gas manufactured from gas companies, with possibly some small additional amount that can be had from natural gas by certain chemical processes. I would say, without betraying any confidence, that there is every prospect that there will be needed additional amounts of toluol. The Government officials have not said this; but we believe that beyond any reasonable doubt there is going to come to the gas companies a sudden and loud call for the recovery of toluol surely, and probably the toluol and benzol from their gas, and it is not unlikely that every gas company in cities of 75,000 inhabitants and over will have to give this matter immediate attention.

Therefore, from the standpoint of the Government officials, the information of our committee is that the need of the military branches for the by-products of the gas works has not yet dawned sufficiently upon the minds of those men of the Government who are able to commit the Government to any line of action, to force them, in the tremendous press of other matters, to act on this one. Apparently the Munitions Board at this time is not yet sufficiently conversant with the needs of our Army and Navy and those of our Allies to see clearly the way out of the difficulty as to the method of getting more of these by-products.

Now as to the gas companies' position. The gas companies are, of course, waiting for some word from the Government before they can go ahead to begin to put in these recovery plants. Is it true that the Government wants more toluol and benzol? Are the other materials that are needed to be used with toluol in the manufacture of trinitrotoluol available in sufficient quantities for the manufacturers to use a large extra amount of toluol?

Installation of Plant an Important Item of Expense

The installation of such recovery plants is going to be a very important item of expense, especially at this time when we believe we are on the crest of a wave of high prices for labor and material and the almost insurperable difficulties in the way of getting materials.

Again, there are some of the largest companies where the most toluol can be obtained per dollar invested or in a given time, that are prevented from going into the business on account of the candle power standards set by the public service commissions or by contract. It will be necessary, before such companies can start on this to have these high candle power standards withdrawn, and that these companies be allowed to take out the toluol and benzol and leave a good satisfactory gas for the consumers.

Effect of Recovery on Gas

What effect will the recovery of toluol and benzol from the gas have upon the gas sent out to the consumers? Personally, it seems to me very clear that the questions of a large reduction in heat units, and the recovery of toluol from the gas, are very distinct. If it is desirable to get all the toluol that is practically possible from our gas, the maximum quantity can be obtained if the gas companies will use in the manufacture of water gas as much oil as they are using at the present time, since the production of toluol is a function of the amount of oil used. I am referring now to those works making a high candle power gas. It would not be necessary or desirable for those gas companies, if they were relieved of their candle power requirements and put on a heat unit basis as many of the other gas works are, to reduce the quantity of oil used so as to get down to the lower standard of heat units; that is, speaking as I am from the point of toluol recovery. In those companies that are now working to, say, 550 to 570 heat units, it might be possible, although at extra cost, to make up by the use of additional oil for the loss in heat units due to the benzol oils recovered and not put back, when they get started on toluol recovery.

The gas companies now find themselves in rather serious straits, and the question of an increase in their rates is one that must engage the attention of the authorities in a very short time. The increasing costs of labor and material have very much increased the cost of gas, and the companies generally may justly claim the right to increase their charges.

Relation to Rate Changes

But the question of the recovery of toluol and the loss in the heat units and candle power caused thereby might be considered, under ordinary times, as a feature of the whole question of change in rates, but at the present time it should not be so considered, and in saying this I know that I am to some extent antagonizing the representatives of the Bureau of Standards with whom I have talked and who may be here in the room at the present time.

These representatives have said to me that if the toluol, or both the toluol and the benzol are recovered from the gas, either wholly or in part, there will be a reduction in the heat units and also a reduction in the candle power, and the consumer will get less for his money than he did before, and consequently this is an argument in favor of a reduction in rates to the consumer under these conditions.

My reply to this has been that the emergency will not permit of mixing this question with that of change of rates for those companies that are now making a high candle power gas; that the reduction of heat units, due to the recovery of toluol, would not be sufficient to lower the gas below a first-class heating value; that where this gas is made up of mixed coal and water gas, or water gas alone, it would still be possible in New York, Chicago, Brooklyn and Philadelphia to recover the toluol and leave a gas of as good heating value as is distributed to the consumers of the other gas companies in those states; and that the burning of the toluol and benzol now being sent out by those companies, which are obliged to use a large quantity of oil per thousand feet, is almost a crime in view of the pressing necessities, for high explosives, of our young men—of whom nearly every man in this room has a relative—who are now going out to fight our battles. I believe that it will be necessary for the proper Government officials to take up with those authorities having jurisdiction over the larger gas companies now making high candle power gas the question of at once relieving them of this necessity.

This of course must be done by careful consideration of the conditions surrounding each individual company and it will require in this capacity a representative of the Government who has intimate and particular knowledge of the gas companies' conditions, of the relations of the gas companies to the consumers, and in a general way all of the many questions that have hedged the gas companies in regards to their regulations and legal conditions.

Cost of Equipment Question to be Settled

Now, outside of these large companies with high candle power requirements, there is nothing particular, as a rule, to prevent the gas companies at once starting in to recover their toluol upon notice from the Government to go ahead, except the question of cost of equipment and how the gas companies are to be reimbursed and provide for amortization of the plant in a very short time, say a year and a half to two years.

The cost of erection of these plants will, as I have said before, because of the press of high prices at this time, be such that the companies will not get their money out of the plants within a year if toluol sells at $1.50 per gallon. The Government in this case should be willing to provide the money for the erection of these plants, or they should guarantee to the gas companies such a price for their toluol over such a period of time as will surely provide, with economic and careful work in the matter of toluol recovery, for amortization of the plant and those incidental expenses, such as reduction in volume, etc., that are contemporaneous with toluol recovery.

I hope that there will be a discussion here today of what is in the minds of the managers of gas companies regarding this question of toluol recovery. This will be useful in guiding the committee in its work. This committee has had several meetings and a number of things have been developed and a great deal of progress has been made in clearing up the situation for quick action. We have shown the Government that it must come to the gas companies for any excess toluol until the time when the steel companies can get ready to increase their production; that the gas companies can not act until the Government tells them to, and we are prepared to discuss, upon invitation, the procedure to be adopted in order to get this additional toluol. A survey of the quantities of toluol that will be required for ourselves and our Allies has been made in Washington and the facts obtained from that survey make us believe that the Government will have to strain every effort to get all the toluol that can be obtained, at least from the larger companies.

Replying to a question from Mr. Tutweiler as to whether the committee had come to any definite conclusion as to the smallest plant it thinks could be operated in the production of toluol, Mr. Gartley explained:

Even 40,000 Population Plants May Be Called Upon

That is a question which can be determined very largely by the amount of toluol the Government will need. Of course, there is also the question of the building of the plant to do the nitration and the securing of the nitric acid and the sulphuric acid. At the present time the Government is seriously in need of more toluol than is at present produced, and that production is now about 10,000,000 gal. yearly.

There would be provided by all companies in cities of over 75,000 inhabitants, eliminating those now taking out toluol and those with natural gas, something like 3,500,000 gal. additional. Whether this is sufficient to give the Government all that is needed has not yet been officially stated, and it probably never will be stated because it is based on certain conditions and the evidence is very strong that there will be a still greater demand than is now figured on as being necessary to prepare for immediately. It is quite conceivable that the gas companies in cities of as low as 40,000 inhabitants may be called upon to recover their light oils, and the collection may still be made more general.

If you have 570 heat unit gas, you will not get as much toluol per thousand feet of gas as those companies manufacturing a high candle power because you will not use as much oil. Assuming a recovery of 0.05 of a gallon of pure toluol per thousand feet of gas—and it may be that this is a little high for the average—I have

said that towns of 75,000 inhabitants will recover 3,500,000 gal. of pure toluol. The Government is not now, I think, figuring ahead more than six months, and you can readily see that there is so much to be done at once that six months ahead is a long way from now, and the main question now is to get toluol from the gas companies and be reinforced later by the additional quantity that will come from the steel companies.

Mr. Ramsburg thinks that 3,000,000 gal. will be produced by the new steel plant being erected. The future of the toluol business, after the war, of course is not at all encouraging. The only use that you can have for it that is known now is its substitution for gasoline as a motor fuel, and in dyes and a few medicines.

In 1913 there were only 750,000 gal. of toluol produced in the country, so when you come to making 17,000,000 gal. and knowing what to do with it after the war is over, I think the steel companies can have that business if they want it.

The benzol production is liable to be embarrassing. In order to get out this toluol so much benzol is taken out that the market is filled with benzol, so that the price can not stay up.

Carl Graf, of Albany, wanted to know at this point what change had taken place in France and Germany. Mr. Gartley replied:

There has been an enormous increase in the coke oven business in Germany. They have succeeded in getting nitrogen out of the air to make their nitric acid, and are using and have used trinitrotoluol right straight along. In England and in France very small works are undertaking the recovery of toluol. They were in terrific haste to get something. You will remember how, under the pressure of their demands, the prices of toluol increased about twenty-five times its former value in this country, and their idea was to get it out of all the small works. But they made this one mistake. Mr. Fulweiler, will you please tell us about the "C" process?

W. H. Fulweiler Explains Process

In the mad haste the English people had to fortify with high explosives, they adopted what is known as a "C" process, which was the suggestion of Charles Carpenter. He said any old works can rig up a tar scrubber, and that was the most available means to get the tar out of their gas. They simply brought the coal tar into contact with the gas and extracted some 60 per cent of the toluol, and the tar was sold to the tar distillers. But even with the introduction of the mineral apparatus, there was the serious handicap that they were handling a five rail fence in order to catch a sparrow. The amount of toluol secured was very small.

Furthermore, the tar distillers over there, according to the gas literature, did not supply it on any arrangement like fifty-fifty, on the increased production of toluol. Furthermore, it was difficult to arrive at any correct referee method of determining how much they had enriched their gas. So it did not turn out to be a satisfactory process. All of the larger plants then began to turn almost immediately to oil instead of tar. They used practically the same scrubbing apparatus, and then they steamed their oils, and this increased the efficiency of their extraction. From that they have developed into flowing live steam into this oil with which the gas has been scrubbed, and they can in that way get a higher oil extraction and recover all light oils.

Mr. Gartley amplified Mr. Fulweiler's explanation by the following statement: I think the method we should use is to wash the light oil out of the gas by the use of a wash oil, and select as a wash oil one from which the light oil can be readily separated. The process is to wash the light oil out of the gas; then separate the light oil from the wash oil; then distill the separated light oil so as to get one fraction particularly rich in benzol, another rich in toluol, and leave the residue in the still, unless you want to go one step further and separate also the light naphthas.

The next step, then, would be the refining of these crude benzols and crude toluols into pure products. This can be done at the gas works but it is not an essential part of the gas works' plant, since these crude benzols and crude toluols can be shipped to other places for refining, provided transportation facilities are available. We must keep in mind the great scarcity of tank cars, barges and steel drums and the high prices for those commodities if new ones are purchased.

If there is no demand for your benzol, of course it must be immediately put back in your gas, leaving only the toluol fraction to be treated. You will not be able, probably, to figure on taking all of the toluol, benzol and solvent naphtha out of the gas; with some water gas if you did, it would bring the candle power down to three or five candles, and of course this is too low to send out. So you will have to be satisfied in taking out the material which when distilled and washed with acid will net 0.04 to 0.05 of a gallon of pure toluol per thousand feet of gas, depending on the quantity of oil used in making the gas. The amount of light oil recovered from the gas will be determined by the amount of wash oil that each thousand feet is exposed to in the wash oil scrubber. It will be possible to take out 0.04 to 0.05 of a gallon of C. P. Toluol with the use of six gallons of wash oil for each thousand feet of gas.

To get all of it you might have to use 20 gal., and this of course would mean a large increase in the size of stills necessary to handle this large quantity of wash oil. Therefore, it is advisable to get a wash oil that is avid for the light oils in the gas and which will readily give up this light oil again under proper heat treatment in stills, since by this method you can reduce the size of the plant needed. It is very unsafe to make any attempt, based on experience of three or four years ago, to prophesy what it will cost to put up an apparatus that will simply recover the light oil from the wash oil, and divide the light oil so separated into crude benzol, toluol and naphtha fractions. In a city of 75,000 inhabitants it would appear that it would be unsafe to say that the cost of a plant for the recovery of toluol could be covered for less than $2.00 per gallon of C. P. Toluol for a period of two years.

It is desirable that the selection of the apparatus to be used for toluol recovery be as cheap as possible, yet should have the main consideration of reclaiming as much toluol as possible from the gas consistent with leaving a good serviceable gas for the consumer, and producing the toluol in such a way as to be available at once for the manufacture of munitions.

Equipment Needed

In reference to the equipment necessary for light oils recovery, Mr. Gartley explained:

It does not require much special apparatus. The main thing is to get hold of some sheet steel. I know that this is not easy to get new, but I have in mind

taking some steel containers that you may be able to pick out from your older material around your works, and if you have nothing of that kind that can be taken down you want to think a long while before you think of getting sheet steel on any new orders that you will now put in. Perhaps there may be some relief in this direction when the Government finds the absolute necessity of getting this toluol out. The other necessities are a few castings which you should be able to get because they are not large, and if you can get these castings and the necessary sheet steel, not much more is required, and you might poke around your works for the balance. Of course, if you want to build a handsome plant for show, it will take you sometime to get it and the war will probably be over when you are ready to produce toluol.

Gas Displaces Electricity for Lighting One of Reading's Largest Public Buildings

C. Calhoun Smith Describes Inside and Outside Installations for Pennsylvania City's Auditorium

C. Calhoun Smith, commercial agent of the Consumer's Gas Company of Reading, Pa., describes the gas lighting installations which displaced electricity in the Auditorium in that city in New Business as follows:

Previous to October, 1916, the Auditorium, which is one of Reading's largest public buildings, had been lighted almost exclusively by electricity, all gas lights having been removed and stored in the cellar.

It was suggested to the managers of the building that the gas company could save them considerable money in the lighting of their building. After some discussion with their Board of Managers, they accepted our plan, and the building is now lighted both inside and outside by gas.

On the outside, which has a frontage of 65 ft., we placed No. 30 Humphrey Outdoor Arc Lamps at a height of 17 ft. from the pavement. These were equipped with alabaster shades, and suspended from fancy, wrought-iron scroll brackets. On the electric posts at the curb, we installed a harp-shaped fixture of bronzed wrought-iron, and hung a No. 30 Humphrey Outdoor Arc in the center. This affords excellent illumination for all patrons alighting from vehicles.

In this building are two large vestibules, and in each of these we hung a No. 2076 Reflex, with No. 228 Reflector. The main auditorium room, with 15,000 sq. ft. of floor space, with a gallery around three sides and a stage at the east end, has been brilliantly illuminated by the installation of 28 four-burner Welsbach Arc Lamps with alabaster shades. In the center of the room, where a boxing tournament takes place once a week, we installed 3 No. 50 Indoor Humphrey Arc Lamps with clear globes, which give sufficient illumination. Underneath the galleries, No. 620 lamps with No. 447 globes, and 8 in. metal ceiling shields, were installed ten feet apart, and owing to the low ceiling these lamps were buckled against the bottom of the galleries. On the side walls, where the galleries do not extend over the main floor, we hung two arm fixtures with No. 620 lamps and No. 447 globes. Back and above the stage, where there is a small restaurant, we installed three No. 2076 Reflex, with No. 228 Reflectors. At the different exits we hung No. 901 Portico Lamps, and in the dressing-rooms No. 620 lamps with No. 6321 C Holophane Shades.

GAS DISPLACES ELECTRICITY FOR INSIDE AND OUTSIDE LIGHTING OF THIS AUDITORIUM

These lights, of course, have been kept on maintenance during the winter, and we are glad to say that the service was completely satisfactory. The consumption from this great array of lights used two or three times a week, was very reasonable, as can be seen from the following figures.

October, 1916	15,000 cu. ft.
November, 1916	30,200 cu. ft.
December, 1916	27,800 cu. ft.
January, 1917	28,300 cu. ft.
February, 1917	65,800 cu. ft.
March, 1917	38,700 cu. ft.
April, 1917	37,000 cu. ft.
May, 1917	24,100 cu. ft.

We feel that this ought to demonstrate to all gas salesmen that large buildings used for similar purposes can be lighted both economically and most satisfactorily by gas.

Encouraging Young Men to Undertake Wide Technical Training Necessary for Calling of Gas Engineer

From time to time there is evidence that the directors of some gas undertakings do not realize that it is now more desirable than ever to encourage young men to undertake the wide technical training which is necessary to make a thoroughly qualified gas engineer, asserts D. H. Helps, representative of the Institution of Gas Engineers on the British Association Fuel Economy Committee, in his report to the Institution. If the entry of such men into the gas industry is not encouraged, progress will be retarded. To quote Prof. Arthur Smithells: "A liberal investment in science should be made."

One direction in which directors could help would be to subscribe their company's funds for the establishment of a works where new processes and plant could be tested and examined, or for gas companies to provide a fund to enable arrangements to be made with some existing undertaking for the erection and testing of new plant, etc.

A Correct Financial Plan the Most Important Element in the Success of a Public Utility

G. E. Claflin Declares the Public Utility Holding Company Has Successfully Met and Supplied a Real Need in the Development of Public Utility Service

A holding company is a corporation owning the stock of one or more other corporations and thus controlling and directing the management of those operating companies, explained G. E. Claflin, vice-president of the Electric Bond & Share Company, in a recent address before the Graduate School of Business Administration of Harvard University.

The subsidiary operating companies of a holding company may be engaged in almost any line of business, but they can usually be classified as either industrial, commercial or public utility companies. Holding companies likewise may be classified as industrial holding companies, commercial holding companies or public utility holding companies, depending upon the class of business transacted by their subsidiary operating companies.

Important to Understand Differences

We are to discuss only the public utility holding company, but it is very important to understand clearly certain radical differences between the public utility holding company and the industrial or commercial holding company. This difference is due to the fact that the subsidiaries of industrial and commercial holding companies are inherently of a competitive nature while public utility companies are not competitive. The product manufactured or the goods sold by industrial or commercial companies are or may be marketed in competition with the product or goods of other similar organizations. It is evident that a holding company owning a sufficient number of subsidiaries in any industry might be able to so manipulate the operations of its subsidiaries as to control the market in that line and fix the price of that commodity. Such action if applied to those commodities which are necessities of life might seriously affect the business of the country besides causing much suffering and many hardships to the people. This danger has been recognized and so-called anti-trust laws have been placed upon our statute books forbidding a monopoly in restraint of trade.

Contrast now the conditions surrounding the public utility operating company. A public utility supplying a community must first secure the consent of the public to occupy the streets with its tracks or pipes or poles and wires. It cannot do business otherwise.

In granting such rights the people reserve through their representatives, the public service commission, full regulative authority over all the business of the utility. Its accounts must be kept in accordance with the rules of the commission and its annual detailed report is a public document and open to every one. Any customer can complain to the commission as to any act or rate of the utility and secure action. Under such control and supervision competition would be of no advantage to the public and in fact would be a disadvantage through the duplication of investment as well as of poles and wires or pipes in the streets. It is now universally acknowledged that these public utilities are natural monopolies, and that while they should be regulated they should also be protected from competition, for the general good of all, and all but two of our states now have such laws in force.

Holding Company Cannot Determine Rate for Any Particular Community

Since each utility is regulated by the public service commission of the state in which it is located, it follows that no public utility holding company, no matter how large and powerful, can manipulate the rates charged by its subsidiaries. Rates can only be changed with the approval of the commission and then only after due notice to the public with opportunity to protest. It is impossible, therefore, for the public utility holding company to so operate its subsidiaries as to cause hardship to the public. For this reason it is free from the serious objections inherent in those holding companies which are of a competitive nature and the public utility holding company must not be classed with them.

Whatever may have been the reason for the organization of other holding companies, the public utility holding company has successfully met and supplied a real need and played no small part in the development of public utility service and indeed in the development of this country.

The public utility holding company through its organization of trained experts secures to its subsidiaries benefits of centralized management in engineering, purchasing, accounting and management. These advantages, however, might be obtained by a centralized management which had no interest in the stocks of the operating companies.

They are an important service rendered to the subsidiaries by the holding company but of much less value than the financial help which the company gives.

In order to understand the importance of this financial service we must understand some of the principles underlying the financing of a public utility. These principles are quite different from those controlling commercial and industrial business, but must be recognized if success is to be obtained, and we must therefore discuss them in some detail.

The service rendered by our public utility companies is a relatively recent advance in our civilization. In the case of the telephone, the electric light and the street railway, practically all this development has occurred within the present generation. In the early years of the electric light and power industry the plants were small and the relatively high cost of the plant and service retarded the growth. As improvements were made and the installations increased in size and extent of service, the promoters discovered that something was wrong with their financial plans.

Example Cited

This first came to my attention about 1891 in a small town in Illinois where I had installed a 500-light central station plant. After the plant had been in operation for some time I was recalled to advise regarding a considerable further increase in plant capacity. The business had grown and some increase of plant had already been made, but still more capacity was needed.

This little electric light company had been financed by a group of local men who had taken the stock of the company to an amount sufficient to make the first installation. They then expected the earnings of the property not only to pay good dividends on this stock but also to pay for the extensions of the property necessary to supply the growth of the business.

On my return the manager, whom we may call Mr. Brown, told me of the growth of the business and the need of more capacity. But, he said, I don't understand

this situation. Our books show that our net earnings represent a good return on our capital, but it takes all of these earnings and more for equipment and material to take on the new customers. We have increased our plant and extended our lines and have taken on the business. Our earnings show a fine increase, but they have not been sufficient to pay for the necessary material and equipment, and we have a loan now at the bank and still need more money. We have paid no dividends and are in debt, and all this in the face of the fact that our books show that we are making money. My partners say that the more business we do the worse off we are and I don't understand it. This was a disturbing situation and a problem which I could not then solve.

Importance of Correct Financial Plan

Now we know that Mr. Brown was ignoring three important principles of public utility finance, and because his company was attempting to do business on principles which apply to commercial business and do not apply to public utility business, he was in real trouble. These three principles were:

First. That a public utility is a growing business requiring continually increasing amounts of money for additions and extensions of its plant and property.

Second. That these expenditures are for permanent improvements and that the investment is therefore permanent, so that the money cannot be provided by short-term loans.

Third. That the total net earnings of the property are not sufficient to provide the increased plant and equipment necessary to serve a rapidly growing business, to say nothing of the interest or dividends which investors and stockholders insist upon having.

We learn by experience and it has only been as the result of hard experience that we have learned that a correct financial plan is perhaps the most important element in the success of a public utility.

As an illustration of the first principle let us consider an electric light and power property. Experience shows that, except in communities where population is actually decreasing, there is a continually increasing demand for service. We used to discuss the question of the maximum amount of service which a given city would demand and assume that when this point was reached the growth of business would depend upon the growth of population. This we called the point of saturation. That idea has long ago been discarded, for we find that new uses are continually being found for energy and each new development seems to bring others and the end is not in sight.

The public utility in accepting its franchise assumes a public duty to furnish a good and reliable service and to supply all reasonable demands. It must therefore be prepared to provide the plant and equipment to fulfill this public duty. This involves a financial plan which will furnish the funds when and as needed.

If the company cannot or will not meet the demands of the community for service it will have to face competition, either from another corporation or possibly a municipal plant. The public will not take excuses.

An examination of the property and account of an electric light and power company will show that on an average, a company which has been operating for several years and which has a gross income of say $200,000 per annum will have invested in its property approximately $1,000,000.

The amount of this investment will vary with the conditions under which the property was constructed. The investment will be larger where the power plant is a hydro-development at a distance from its market than if it is a steam plant and near the center of distribution, or if the distributing system is largely underground instead of overhead.

These and other conditions may make the ratio of investment to gross earnings as low as four or as high as seven or eight to one. Let us assume five as a reasonable figure for our illustration.

In making additions and extensions to the property and to the power plant in particular, it is impractical to install units of exactly the size to supply the expected growth of a single year. This would be poor engineering as well as poor business judgment. The additional installation is made after careful study of the situation with a view of future growth and economy of operation. This usually results in the installation of considerable excess capacity over the immediate requirements of the business. For this reason we find that over a period of years there are some years in which relatively large investment is made followed by other years in which the amount of funds required is relatively small. It is interesting to note, however, that over a period of years' experience shows that the ratio of increased investment to increased gross will remain approximately continuous, or 5 to 1 in our case.

Rate of Increase Varies

The increase of business will, of course, vary with communities and conditions, but a 10 per cent increase in gross earnings per year is an ordinary growth.

In our illustration we assumed a gross of $200,000. A 10 per cent increase would therefore be $20,000 and on our ratio of 5 to 1 it is necessary to expend in improvements and extensions of property $100,000 largely during this year, in order to provide facilities to serve this $20,000 additional business next year. Now, if the rate of increase of business continues to be 10 per cent, which is not at all unusual, you will see that the amount of increase in the second year is $22,000, in the third year $24,200, and so on in increasing amounts. In the same way the funds required for the extension of this property will be $110,000, in the second year, $121,000, in the third year, and in increasing amounts thereafter.

Our financial plan, therefore, must provide money in increasing amounts from year to year as needed to furnish the facilities to enable the company to serve the public.

To illustrate the second principle, our public service company with an investment of $1,000,000 had gross receipts of $200,000 per annum. A comparison of these figures with those of a commercial business shows a surprising difference. A commercial business having an investment of $1,000,000 which does not show an annual gross of $6,000,000 is unusual and the figure is frequently much larger. In this case the merchant is said to have turned over his capital six times during the year. Our lighting company on the same theory has turned its capital one-fifth of a time in the year. The merchant therefore turns his capital thirty times as fast as the utility, which it must be prepared to furnish on demand without notice.

Handling Commodities vs. Furnishing a Service

The explanation is that the merchant is handling commodities while the utility is furnishing a service. It is important to understand this difference clearly.

The merchant can often buy goods on two or four months' time or longer, with the possibility of selling

these goods at prices which cover their cost, plus expenses, plus a profit, and thus have the proceeds in hand to pay his bills when due. In other words, the merchant can do business largely on capital borrowed and repaid at short intervals because this money is invested in commodities which are rapidly handled and when sold return not only their cost but a profit over expenses.

The lighting company, on the other hand, is furnishing a service which it cannot manufacture in advance, but which it must be prepared to furnish on demand without notice. It cannot ask one customer to wait while another is being served. The service must be rendered when the button is pushed.

To prepare for this service the lighting company constructs its plant and lines and installs its meters. The customer, however, does not purchase any of these things upon which the lighting company has expended its money. The customer wishes and pays for electrical energy and all of the investment made by the lighting company must be and remain in place in order that this customer may continue to be served. The investment, therefore, is permanent.

Our financial plan, therefore, must provide money on a basis which requires repayment, if at all, only after a long period of years when it can be refunded.

As an illustration of the third principle: In the case of the merchant whom I mentioned with his annual turnover of six times his capital per year, the only limit upon the profits which he may make is fixed by competition with other merchants. If, however, he is a skilful buyer and a good salesman and by economies on the one hand, and on the other by increasing his turnovers from six to perhaps nine per year and thereby largely increase his net profits, there can be no objection by anyone.

The public utility, however, is limited by law to a reasonable rate of return upon its investment. This reasonable rate is fixed by the public service commission, and practically is the lowest rate which will induce people to undertake the construction and operation of these utilities.

Present Unfair Methods of Regulation

It should also be remembered that if the management by its skill and good judgment is able to so operate its property that the return is increased above the figure set by the commission, it is not allowed this reward for its good work. The commission will lower its rates for service sufficiently to reduce its rate of return to the figure which they had fixed. In other words, the management is penalized for its good work by having its rates reduced and the public gets the full benefit. This is one element in the present method of regulating public utilities which is unfair and should be changed.

The rate of return has been fixed by some of our commissions at 8 per cent. That is to say, the utility may charge such rates for its service as will produce, after payment of operating expenses, taxes and reasonable reserves for depreciation, etc., net earnings equal to 8 per cent upon the value of its property.

In our illustration the lighting company was assumed to have an investment of $1,000,000 and a gross income of $200,000. By careful management this property might operate on a 60 per cent basis, or in other words the operating expenses and reserves might perhaps be kept down to 60 per cent of the gross or $120,000, leaving net earnings of $80,000, which is 8 per cent on the assumed investment.

We have previously assumed that this property is growing at the rate of 10 per cent per annum and that we must immediately spend $100,000 for facilities to serve the $20,000 of new business which we will have offered to us next year. Our net earnings are $80,000 and we need $100,000 for extension of our property.

Our total net is less than our requirements for this year's extensions and we know that the situation will be the same next year and every year that our business continues.

We must therefore have a financial plan which will continually provide additional money from outside sources because our earnings are insufficient and must be used to pay interest on the capital used.

We must therefore go into the general investment market for our money and the securities which we produce and attempt to sell must stand the tests which careful investors have learned to use on all investment securities.

Safety of principal is of first importance, but in the loaning of money there are degrees of safety of the principal and to a considerable extent the rate of interest is an index of relative safety.

United States 3 per cent Government bonds sell at 99 to par in the market while we find 5 per cent public utility bonds selling at varying prices from par down to perhaps 70 per cent of par, depending upon the condition of the company and its business, which in other words means the estimated safety of the investment and the certainty of the interest being paid regularly.

Must be Marketed at Definitely Low Rates

An investment which cannot be easily and quickly sold is less attractive than another which, because of its marketability, can be sold by merely telephoning your banker to sell. This is true even if the first is a safer investment than the second, because in an emergency the investment which cannot easily be sold is useless. Banks will not accept such securities as collateral for loans because if the loan were not paid the bank could not sell the collateral to save itself from loss.

Now we have seen that the public utility may be allowed to earn 8 per cent on its property value. Our financial plan therefore must produce the money at a cost of less than 8 per cent if we are to have anything left after paying interest charges to compensate us for our time and skill in managing the property.

Interest rates are lowest on first mortgage bonds because under a carefully drawn mortgage the safety of the investment is well guarded.

Other Classes of Appeal

We will therefore mortgage our property and issue first mortgage bonds. Of course, we cannot issue bonds to the full cost of the property because no one cares to make a loan to the full value of any property. We can, however, issue bonds to about 80 per cent of the value of our property. These bonds will be considered by the class of investors which demands safety of principal and interest rather than rate of return. These are people whose only income is derived from their invested capital, so that if the capital were lost their income would cease. Our bonds, therefore, will be studied with great care by such people and the price which they will pay for them, if they buy at all, will depend upon the showing of safety and stability which we can make.

There is another class of investors which is willing to

(*Continued on page* 638)

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Bind Your Copies

Older readers of THE AMERICAN GAS ENGINEERING JOURNAL will notice without doubt the greatly increased number of pages devoted to the index of articles in the volume this issue closes. There is a purpose in making this index thus complete. We want all our readers to bind their copies and we desire to furnish them a ready reference to any information they may desire to look up. To accomplish this we have indexed each important item under a sufficient number of heads as to almost insure that if a very small part of the original caption remains fresh in the reader's mind he will be able to readily locate the article itself.

A part of the increase in the size of the index is due to the increased number of articles the journal is publishing, but the greater part is due to the reason cited.

We cannot too strongly urge that all readers—especially the younger ones—form the habit of thus preserving at least the text pages of their copies. It is our aim to devote the greater part of our columns to information that will have a permanent value.

We sincerely believe that the gas man who follows this course will have in the course of a very few years a wealth of information pertinent to his calling that would be difficult to obtain in any other manner.

Filling Out the Gaps in Our Working Forces

Various means have been suggested for helping over the man-power shortage gas companies are certain to be confronted with, through the elimination of certain tasks or operations, which though hitherto considered necessary, subjected to close scrutiny reveal themselves not to be absolutely essential—at least temporarily. Such means will help out without question. The more general use of women in gas works operation will also contribute. But this journal believes that the problem will be solved mainly by additional work being laid on the shoulders of those already employed and who remain in the service of the companies instead of being marshalled into the Nation's service.

This is not unreasonable. All of us, the highest paid executive as well as the office boy, will have to give more time and energy to our work than we have been giving hitherto. Otherwise everything would stop. Ten men working at their usual gait cannot keep a plant running that hitherto required twenty.

Nor will the extra effort, unless long continued, injure us in any great degree. The AMERICAN GAS ENGINEERING JOURNAL does not, under normal conditions, believe that long working hours are an economic advantage. By making use of such means a company secures quantity in terms of time, but sacrifices quality. It obtains a greater number of hours of work from the individual, but it develops a dull man.

We had been gradually—not only in the gas industry, but in all industries—getting down to basis where the individual, through properly proportioned days, was being enabled to render his maximum efficiency to the company. In many cases we had arrived at the point where old-fashioned executives considered the period of work represented the period of least importance in the man's daily life. Asked for his frank opinion he would have declared that two hours could be added to the day without the least hardship. In a sense he would speak with reason. There was a leeway.

For a limited period every man in the company could have that number of hours and more added to his day and the organization's efficiency not be effected in the slightest. The reason is simple.

We have not been working ourselves up to the last notch. We have stored up a certain amount of surplus energy. Now we are confronted with a condition where we will be called upon to draw on it. There should be no hesitancy shown in responding to the call.

Gas company managements had no hand in making the emergency. They are, to a vastly greater extent than the individual, beset with increased difficulties and responsibilities. Now is the time when those gas companies, which by considerate treatment, have built up a spirit of co-operation in their organizations, must cash in on their investment. Now is the opportunity for the employee to show that he is not lacking in gratitude and good will towards his company.

Acquiring the Saving Habit

The habit of saving is not easy to acquire. It represents a sacrifice at the best, and under normal conditions, none of us like to make sacrifices.

But these are days of sacrifice. Many of our countrymen will sacrifice even their lives in the near future. Many of our biggest men are giving their whole time to National purposes, which represents the sacrifice of great sums of money which could otherwise be gained.

Countless spendthrifts, hand-to-mouth livers, subscribed to Liberty Bonds, sacrificing what to them was almost an essential; the freedom of wasting each day's wage as it was earned. The investment meant nothing to them; assumed no tangible shape in their careless minds. In buying they were moved solely by patriotic motives. It afforded them a means of helping out the country, and they grasped at it eagerly.

The first Liberty Bond issue is a thing of the past, but more bonds are to be issued. Gas men in general should stint themselves to acquire as many of them as they possibly can. In the immediate present they will be materially aiding the Nation in its great task. In the long run they will be taking a very great step towards financial independence.

They will acquire the habit of saving, even to the point of deprivation. They do not need to fear that they will become misers. The average American will have to go a very long ways, unfortunately, before he reaches that state.

They will have in their bonds, at the end of the war, interest-bearing investments that will be practically as negotiable as gold, but with a probable enhanced value. And the man who has a fair sum of money in the bank doesn't have to tremble over the loss of his job. He is financially foot loose. There is a better job waiting for most every man at some other place. The main difficulty has been to get enough money ahead to tide him over while he looked for it.

Now is the time to lay up the sum no man should be without. In these days it is easy to sacrifice things we think we want. All those about us are making sacrifices so we can be assured of plenty of company.

More Nonsense About Abolishing the Candle Power Standard

Some newspaper attacks on the motives of gas companies in seeking to make their gas to a heat unit standard seem very strange indeed at this day and age. One would infer from reading them that the companies are seeking to shoulder a vast imposition on their consumers.

We do not know of one gas company of any size that would look without trembling on the prospect of losing a good part of their gas lighting load. We do know of at least one large combination company that is openly solicitous in regard to its gas lighting load.

The newspapers, we think, sometimes overlook the fact that though public utilities are by their nature monopolies, the lighting business is on very much of a competitive basis. Further this competition is in the class of service rather than in the matter of cost. It is highly unlikely, therefore, that gas companies will detract any element that will lessen the quality of their service. If they did the electric company would step in very promptly and carry a good part of their business.

The strongest hobby of the gas man who has been most in the public eye recently in regard to the substitution of the heat unit standard is gas lighting. If this man even suspicioned that its adoption would be at the cost of reduction in gas lighting business he would shy away from it as he would from a can of nitroglycerine dropping from a forty-story building onto a granite pavement.

Our newspaper friends have consistently contended that the first thought of a public utility is always self interest. This being the case they can be assured that no gas company would want the heat unit standard if it necessitated in anywise a decrease in the quality and efficiency of its service.

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take a little more risk provided they get a higher interest rate to compensate for the increased risk. To meet this situation we will get out some preferred stock bearing 6 per cent or 7 per cent dividends. If our property is well managed we will be able to secure practically all of our money through the sale of bonds and preferred stock and at a cost of between 6 per cent and 7 per cent.

On this plan and having a good record of growing earnings and of good relations with the public which we serve, we can continue to issue and sell bonds and preferred stock year after year to provide for the requirements of our growing business.

In actual practice securities are not sold by the utility company directly to the investor except in rare cases and in limited amounts.

The business of selling investment securities is highly specialized. The investor has not the time or facilities for assuring himself that the bond or share of stock which is offered to him is a safe investment. He also could not afford the expense involved in such an investigation.

This is the business of the investment banker as a distributor of investment securities. He must investigate all of the buiness conditions surrounding a public utility, including the local public sentiment, examine the physical property and estimate its value, check up all legal details connected with the organization of the company and the validity of its franchises and assure himself that all legal technicalities have been complied with in the issuance of the securities which he is asked to purchase. This requires a competent organization and involves much time and expense.

When the banker has completed such an examination and has purchased the securities, he is able to send out his salesmen armed with the statement that " we have checked up all these points as to safety of the investment and future possibilities of growth of property and recommend these securities for investment." The investor thus gets the benefit of an independent examination and report on the property.

The reputation and continued success of the banker is dependent upon the character of the investment securities which he recommends and sells to his clients. He must therefore use care and good judgment in selecting his securities if he is to retain his customer.

Economy in Selling Large Issues

Our utility must therefore endeavor to place its securities through some banker. The banker, like any other merchant, must be careful to buy only such goods as he can sell, and must also consider the cost of selling. This cost must include the cost of the legal, technical and business investigation which I have mentioned and which, as made by careful reputable bankers, is expensive. This cost will be the same in any case whether the bond issue at the time is $100,000 or $1,000,000 or more. It is clear however that the cost per bond will be ten times as much if the issue is $100,000 than if it is $1,000,000, which is a very serious difference. On the smaller issue this would mean that the banker must buy the bonds at a correspondingly low price, if at all, in order to sell at a profit because the selling price must compare with other similar securities in the market.

The banker, therefore, will not only apply to the securities of our utility the test of the essential points of security, but will consider the size of the issue and cost to investigate the situation. If our district has more than 100,000 population and our property will warrant the issue of several millions of clean first mortgage bonds the banker will be much interested. But if we must mention a smaller issue of bonds and a smaller population served, we will not find a cordial reception.

When cities reach a population of more than 100,000 there seems to be a certain force or momentum which insures a continuing growth. Below this figure they doubt increase and security values decrease, except in certain cases where local conditions change the rule.

Consider now the condition in cities of say from 10,000 to 50,000 population, of which there were 489 in this country in 1910. The cost of plant required to serve such cities is not large and the bond issue in such a situation would ordinarily be small.

If a security issue on a utility in some good city in this class were offered to an investment banker he would probably say, if he took the time to explain his experience:

" I doubt if I could sell those bonds. Our investors are afraid of small cities. Your present growth, while very good, may be the result of special conditions and your population and earnings may be less in 1920 than they are to-day. We have had some experience with situations of this kind and your town is not big enough for us to be sure that its growth is stable. Your issue is small and hard to sell because our investors like a large issue, so that there will always be more or less buying and selling of the bonds. This gives them assurance of quick market and makes the bonds good collateral because they can be turned into cash without trouble or delay. Our people would also wish to buy such a bond if at all on a relatively high interest yield, and on account of the cost of investigation you would have to sell to me at a very low price."

This price, if the banker ever got so far as to name it, might easily mean a rate for the money which was higher than the utility was allowed to earn.

As a matter of fact the banker would probably say at once, " I can't sell such securities. You will have to finance that situation locally."

This is exactly what has happened in a great many cases.

Securities of Small Community Utilities Cannot Be Sold in Investment Market

The securities of utilities serving the smaller communities cannot be sold in the investment market. Such utilities, therefore, had to be financed locally and generally passed through reorganizations with loss of money to investors, because they failed to meet the demands of the community and perhaps suffered loss of business through competition. The old plans of financing such public utilities failed to meet the requirements.

The public utility holding company form of organization and finance has successfully met these conditions and has developed many situations which must otherwise have failed.

The financial plans of public utility holding companies vary somewhat, but in general are based upon the sale of the preferred and common stock of the company. Additional funds are sometimes secured from the sale of collateral trust bonds, which are issued against certain bonds of subsidiaries deposited with a trustee as collateral. Long-term debentures have also been sold. These last are unsecured except by the credit and general assets of the company.

The assets of the public utility holding company consist of the securities of its subsidiaries, and its income is principally derived from the interest and dividends received on these securities.

In the case of the small subsidiaries, the holding company must usually hold all of their securities and must furnish additional money to them as needed in return for additional securities.

The bonds and preferred stock of the larger subsidiaries can be sold to the public and the holding company will retain the common stock. Sometimes the bonds of even a small subsidiary can be sold because of the knowledge that the holding company owns the equity in the subsidiary and will carry it through any trouble. Such sales are really made on the credit of the holding company.

The public utility holding company is not subject to the control of any public regulating body, but its securities must be sold in the investment market in competition with all other securities. The same tests will be applied to these securities as to others, but the stocks of the public utility holding company have an element which is important in the question of safety and of continuity and regularity of the return.

This is the element of diversity, which results from the fact that its subsidiaries are located in different sections of the country. This averages the risk, because unusual adverse conditions are not likely to occur in all sections of the country at once. This principle of diversity and of averaging the risk is the basis upon which our insurance companies operate.

It is this stability which interests investors, and the longer the record the better the credit of the public utility holding company.

Improving credit means increasing safety of investment and therefore lower interest rates. Business troubles in the district served by a subsidiary may at times make it very difficult for that subsidiary with its decreasing earnings to sell its securities to the public or even to make short-term loans. The credit of the holding company, however, will not be seriously affected and it can secure loans and help its subsidiary and usually at much lower interest rates than the subsidiary could have secured.

These advantages accrue to the large as well as the small subsidiaries and have often proved of great importance.

Why Not One Large Corporation

The question is sometimes asked why could not all these subsidiaries be consolidated into one large corporation and gain all the advantages of credit, volume of business and diversity which are claimed for the holding company and its subsidiaries.

Where the properties are located in one state this can be done and very often is done, especially where the properties can be physically connected.

The consolidation of a number of properties located in different states and subject to different public service commissions is impractical, because of the varying forms of accounting and other requirements of the different commissions.

The public utility holding company often consolidates several small subsidiaries located in one state into one large company. It may purchase one or more small properties and by connection and further additions build up a single large subsidiary. I have in mind a case of this kind where the original property had at the time of purchase approximately $217,000 gross per annum and operated about 300 miles of transmission and distribution lines in less than five years has been enlarged through purchases and extensions so that to-day it operates more than 1,600 miles of transmission and distribution lines and in addition has a gross of more than $4,526,000.

Some of the small properties which were purchased were not giving day service and were charging higher rates than are in force to-day, and several were in serious financial condition. The people of those localities are to-day getting better service than before the consolidation. This result was accomplished through a holding company and I question whether it could have been done in any other way.

The holding company because of the volume of business represented by its subsidiaries is able to command the best of executive, financial and engineering ability, and its large purchases of material and equipment enable it to secure the most favorable prices.

These facilities and its credit enable the holding company to develop the business of the subsidiaries to the best advantage and quickly to mobilize men, material and money to meet an emergency.

The managers of the local subsidiaries are not worried as to how they can secure funds for necessary extensions, but on the contrary are continually urged by the holding company management to make all extensions which will secure paying business. Under this plan there is practically no limit to the money which can be secured for extensions to the property, provided only the extensions produce the rate of return permitted by the public service commission.

Stimulus to Quest for New Business

This condition results in an active search for new business by the subsidiary. The utility is not only ready to serve the ordinary demands of its community, but is seeking new uses for its output and is foremost in efforts to secure new industries and build up the community. The benefits of this policy are mutual, for it results not only in the growth of the company but also in the growth of the community and in the improvement in living conditions brought about by the many convenient and useful household appliances which are made available to all.

The holding company benefits, because the small subsidiaries grow into large ones and are able to sell their securities on the investment market. This not only relieves the holding company from the burden of financing these subsidiaries and thus enabling it to acquire others, but their increased stability has improved the credit of the holding company itself so that it can obtain money more easily and at lower rates.

The independent companies acquired by the holding company are sometimes operating at a profit, which, however, can be increased by the ability of the central organization. For the most part, however, the acquired properties were in, or on the verge of trouble caused by their failure to recognize the principles of public utility finance which I have mentioned. They must be re-organized and often partially reconstructed before they can be successful either physically or financially, and this may mean a considerable period when earnings are insufficient to cover expenses and fixed charges. The property must be carried through this unproductive period and the holding company method readily accomplishes this.

PUBLIC UTILITIES MUST SO CONDUCT THEIR BUSINESS AS TO PRESERVE AND ACQUIRE A FAVORABLE PUBLIC SENTIMENT

The holding company form of organization has had a rapid growth, which seems destined to continue. It has been estimated that the total capital employed in electric, gas, street and interurban railway companies in this country is in excess of eight billion dollars. Of this capital about 70 per cent is controlled by holding companies.

But the mere organization of a public utility holding company does not insure its success. Integrity, good judgment and experience are just as necessary for success in this as in any other business.

Public utilities to be successful must so conduct their business as to deserve and acquire a favorable public sentiment. This is something which it takes years to build up but which may be lost in a day by wrong policies towards the public. The customs and characteristics of the people vary in different sections of our country and the holding company management must recognize these differences and provide a local management which will fit the local conditions and develop a feeling that the utility is an important part of the community and working for its development.

The growth and success of the public utility holding companies show that these principles have been realized and also that these companies fill an important place in the development of our country.

Great Progress in Development of Apparatus for Efficient Consumption of Gas

Although much progress has been made in the manufacture of gas, the advance in the design and construction of apparatus for its more efficient combustion, and generally in the economical consumption of gas, has been still greater, declares D. H. Helps, representative of the Institution of Gas Engineers on the British Association Fuel Economy Committee, in his report to the Institution. The introduction of the incandescent burner with its mantle has increased the lighting duty of a cubic foot of gas by at least 900 per cent when the low-pressure burner is used, and by 2,000 per cent in the case of high-pressure burners.

As regards gas-fires, their use is extending very rapidly, owing to their increased efficiency as heat radiators and ventilating agents. Further improvements may be looked for in the construction of gas-fires, and also in gas-heated cooking-stoves.

A considerable percentage of the gas consumed is now used for providing hot water for domestic use, and improvements are constantly being made in the apparatus required for this purpose.

Domestic Production of Coal-Tar Dyestuffs Trebled Since 1914

The latest figures of the U. S. Bureau of Foreign & Domestic Commerce indicate that instead of seven concerns engaged in the coal-tar dyestuffs industry in this country—the number in 1914—there are now some 150.

The data is incomplete, but taken as a basis for computation, it shows that whereas American plants made about 6,500,000 lb. of coal-tar colors in 1914, they are now producing at a rate which may be around 20,000,000 lb. a year.

Coal Committee Statistics Indicate Fears as to Coal Shortage are Unjustified

One of the efforts of the Council of National Defense is shown by the work of the Coal Supply Committee, states the U. S. Chamber of Commerce in a recent bulletin. It is said not only has this committee been able to propose arrangements, the adoption of which have brought about a distribution of coal to meet the government's requirements and many of those of business, but the statistics which this committee has been able to compile on one hand on requirements, and on the other hand on probable supplies, indicate that the widespread anxiety which has existed throughout the country over a shortage of coal is possibly unjustified. When the country comes to know the facts which this committee has compiled anxiety will doubtless be allayed, it is said, and people will probably feel they can go ahead in confidence that all coal required will be forthcoming.

Toluol and Sulphate of Ammonium Production Contracted for Many Months in Advance

Government requirements of toluol for the making of trinitrotoluol have practically absorbed the output of producers for many months. Prices on contract range from $1.50 to $1.75, according to quantity and delivery. The Government purchases have been made at the inside figure. The Aetna Explosives Company is reported to have purchased a large order at $1.25 a gallon.

Benzol is pretty well sold up for a few months ahead, but there are larger quantities available for spot shipment than of toluol. The demand for benzol for making picric acid has been increasing. Prices remain firm on the basis of 55 to 60 cents for the pure.

Ammonium sulphate production has been contracted for 12 months ahead by manufacturers of fertilizers. The present price ranges from $4.40 to $4.50 per cwt., bulk basis, Atlantic ports.—*Iron Age.*

Best Gas for Consumer is Gas that will Provide the Greatest Number of Heat Units for the Sum Expended

It is most desirable in the interests of all concerned that a calorific standard should be substituted for the candle power standard, states D. H. Helps, representative of the Institution of Gas Engineers on the British Association Fuel Economy Committee, in his report to the Institution. The days of monopolies in the supply of artificial light are past; and it is reasonable to suppose that the suppliers of gas will not be so unwise as to distribute a commodity which is not the best suited to the requirements of their customers, for if they did so they would cease to receive the support of the public.

While, on the one hand, the adoption of a definite calorific standard for the whole country would facilitate the manufacture of apparatus for the consumption of gas, on the other hand, owing to variations in the quality of the coals carbonized, it would not be advisable to fix a uniform standard.

In considering this question, Parliament should, to a large extent, be guided by this consideration—*that what is best for the consumer is such a gas as will provide the greatest number of heat units for the sum expended.*

News of the Gas Industry

Dallastown Plant Sold

The Dallastown, Pa., plant of the Suburban Gas & Fuel Company was sold at a receiver's sale at the plant recently to Philadelphia capitalists headed by John R. Schall. The board of directors will organize as soon as the court confirms the sale. H. S. Dutton, Jr., West Chester, who has been with the United Gas Improvement Company for 11 years, will be the new manager, and George H. Taylor, Downingtown, who has also been in the employ of that firm for 18 years, will serve as district superintendent. The sale relieves C. C. Grim of the receivership he has held for some time. The gas and fuel concern supplies its product to Dallastown, Red Lion, Windsor and Yoe.

Artificial Production at Kokomo, Ind., to be Discontinued

We are informed by W. R. Higgins, superintendent of the Kokomo Gas Company, Kokomo, Ind., that by a mutual agreement between the artificial and natural gas companies of Kokomo, the city is soon to be supplied entirely with natural gas, and the manufacture of the artificial product to be discontinued.

The natural gas comes from local fields, and the supply seems abundant. It is now being used by many of the industrial plants for furnaces, and by the automobile plants for block testing.

The present price is 55 cents.

Maine Company Raises Rates

The York County Power Company has filed with the Public Utilities Commission a new schedule of gas rates which will be effective July 1, 1917. An increase of approximately 25 cents per 1,000 cubic feet is made in the rates.

The charge per 1,000 cubic feet will be as follows after July 1, per month: First 3,000, $1.60; next 3,000 $1,40; next, 4,000, $1.30; next 10,000, $1.20; balance, $1.10.

The minimum charge will be $6 per year and this charge will be for all installations. Meters, other than those of the pre-payment type, will be billed at the rate of 50 cents per month and adjusted annually.

Steam Curtain Smothers Flames in Gas Well Fire Wasting 44,000,000 Cu. Ft. Per Day

Former Deputy Chief Guerin of New York City Fire Department Makes Use of Novel Method to Stop Vast Waste —Pressure of Gas 1,500 lb.

Shooting up from the well under a pressure of 1500 lb. per square inch 44,000,000 cu. ft. of natural gas per day burned for 5½ days, despite feverish efforts to control the waste. Due to the great pressure the closest approach of the flames to the ground was 100 ft. distant. Former Deputy-Chief William Guerin of the New York City Fire Department was called in and, by adopting a method used formerly on a smaller scale, extinguished the flames in 15 minutes.

The well is located seventeen miles west of Monroe, La., and is owned by the Ouchita Natural Gas & Oil Company. It had been flowing at the rate of 44,000,000 cu. ft. a day under a head pressure of 1,500 lb. to the square inch.

On Saturday, June 16, a gang of men were working in the well house when there was a terrific crash as the gas pressure blew off the cap from the well and sent it hurtling high in air, with fragments of the 10-in. pipe through which the gas was flowing.

Very soon after this there was a tremendous explosion as the gas took fire. Instantly there appeared in the air a huge ball of fire. The flames covered an area of several acres and were accompanied by a deafening roar.

Owing to the pressure and the speed with which the gas flowed the flames could not approach the ground nearer than 100 ft.

The employees of the company tried in every way to control the fire but without effect, and a call was sent for help to the gas companies of Texas, Mississippi and Arkansas. Within twenty-four hours a great number of gas experts were at the scene and many means were suggested for controlling the fire. None of them proved available.

At this point it was decided to call upon New York for help. A telegram accordingly was rushed to the Pyrene Manufacturing Company, asking them if they could suggest any means by which the fire could be extinguished.

Three hours later Chief Guerin,

Japanese Gas Official Visiting Big U. S. Plants

K. Hagiwara, of Tokio, Japan, head of the commercial department of the Tokio Electric Light Company, arrived in Baltimore from Washington recently and registered at the Hotel Stafford.

Mr. Hagiwara, at the invitation of Herbert A. Wagner, of the local gas and electric company, will go through the Baltimore plants and will study the methods applied in city lighting. Since his arrival in San Francisco three months ago Mr. Hagiwara has visited many cities of the United States and will inspect, before he returns to Japan, the methods in most of the principal cities of this country. Accompanying him is Robert P. Parrott, of New York.

Fire at One of Detroit's Purifying Stations

Fire broke out in the purifying room of Station B, Detroit City Gas Company, foot of Meldrum Avenue, midnight Wednesday, June 13, and caused damage estimated at $8,000. The fire will indefinitely suspend operations of this supply station, which will materially cripple the company's output.

$250,000 Doherty Contribution to Red Cross

The directors of the Cities Service Company at a meeting held at the office of Henry L. Doherty & Company on June 20, voted to create a fund of $250,000 to be given to the American Red Cross.

who is head of the company's engineering bureau, started for Monroe on a special train. He arrived on Thursday morning and after a study of conditions devised a plan by which the fire was extinguished .

"The fire had been burning since 10.15 o'clock on the evening of June 16," states Chief Guerin. "It was extinguished at 1.15 o'clock on the morning of June 22, after it had been burning for five and one-half days. In that time 242,000,000 cu. ft. of gas had been burned, the loss being conservatively estimated at $3,300,000.

"After the fire had been burning for three days the state consultation commissioner, J. H. Owens, called on the company and insisted that something be done to extinguish the flow and save the gas. It was proposed to dynamite the well and extinguish the flames by concussion. This method, however, would endanger the casing and it was considered that as a cure it might be worse than the disease.

"Gas wells have burned in this section for three years and the prospect of losing this amount of gas on a daily flow of 44,000,000 cu. ft. was staggering.

"After looking over the situation I decided that the problem was exactly the same as one that I had faced while in the New York Fire Department.

"The only difference was one of degree. Two hose lines, working under very high pressure were led up to the well as close as possible and the water turned on. After cooling the ground and what remained of the pipe the two lines of hose, opposed to each other, were gradually raised. Meeting as they did in the column of gas, as soon as the stream reached the base of the flame the water was turned into steam which formed a curtain shuting off the gas from the blaze above it in such a way that the fire was extinguished almost magically."

Representatives of oil and gas interests say that this method of extinguishing a gas well fire is absolutely new and that it provides a weapon which will take much of the terror out of gas well fires in the future. The fire in this case was complicated by the tremendous flow of gas and the terrific heat which was generated. This prevented anyone getting close to the fire to attack it in the usual way while the pressure of gas made usual methods of procedure absolutely futile.

Chemical Industries to Hold Exposition in New York September 24

The Third National Exposition of Chemical Industries, to be held at the Grand Central Palace, New York, during the week of Sept. 24, this year, preparations for which are in active progress, with an advisory committee, composed of Chas. H. Herty (chairman), Raymond F. Bacon, L. H. Baekeland, Henry B. Faber, Colin G. Fink, Bernhard C. Hesse, A. D. Little, R. P. Perry, Wm. Cooper Procter, E. F. Roeber, G. W. Thompson, T. B. Wagner, Utley Wedge and M. C. Whitaker, the managers, Charles F. Roth and F. W. Payne, report will this year be larger and more interesting than its predecessors. At the close of the past exposition much of the space available on two floors then used was re-engaged by exhibitors for this coming exposition. The present time sees these floors completely taken and the greater part of the available space on the third floor engaged.

A great section of exhibits showing the industrial opportunities our South presents in its raw materials will be known as the "Southern Opportunity Section." A "Paper and Pulp Industry Section" has been provided and many elaborate exhibits are in preparation for the paper men when the Technical Association of Pulp and Paper Industry members visit the exposition, as they have promised to do again this year. Other exhibits will be of interest to men from the rubber and textile industries. Many more dyestuffs companies have engaged to exhibit their products than were shown formerly. Many of the chemical and allied industry companies have so expanded their operations in the past year, and their products and interests have become so numerous, that they require much additional space to make adequate showings.

Report of Portland Cement Industry

Complete statistics of the Portland cement industry in 1916 show that the shipments for that year, 94,552,296 barrels, valued at $100,014,882, hold the record, and that the production, 91,521,198 barrels, is second only to that of the record year, 1913, when 92,097,131 barrels were manufactured. The stocks for 1915 have been revised slightly by the manufacturers.

Higher prices for cement prevailed throughout the United States in 1916, except at a few places where top prices were realized in 1915. The average factory price per barrel in bulk at mills was $1.058, compared with $0.860 in 1915, an increase of 19.8 cents, or 23 per cent.

The combined production of natural and puzzolan cements in 1916 was 842,137 barrels, valued at $430,874, compared with 793,541 barrels, valued at $398,428, in 1915.

These statistics, compiled by Ernest F. Burchard, of the U. S. Geological Survey, Department of the Interior, are based on returns from every active plant in the United States and differ from the estimated figures, released Jan. 1, 1917, by only 0.04 to 0.4 per cent.

Hot Plates and Small Stoves in High Favor

The sale of gas stoves and hot plates of the smaller type is making phenomenal records in some of the New England gas companies. The high price of coal, together with a seeming tendency of many families to remain at home during the summer rather than go to seaside resorts, makes the use of these convenient and simple domestic devices the logical and proper course.

It is pointed out that while coal is 50 per cent, or more, higher than normally, the product that comes from the burning of coal, reaching the customers through the mains of the gas companies, is at the same level of cost to the consumer as in years past. This condition naturally makes the public attracted to the use of gas, the convenience and cleanliness of this form of fuel being "thrown in for good measure."

Two burner stoves are especially popular. A small family can do light housekeeping during the summer with one of these devices, relying on the corner bakery for bread and pastry which, like the gas, have not risen in price to correspond with the increase in the price of the ingredients.

Hydrogen Gas Plant at Newport News, Va.

The War Department has awarded a contract to the Improved Equipment Company for the construction of a large hydrogen generator gas plant for manufacturing gas for dirigibles at the Government aviation experimental station in Newport News. Work is to start immediately.

Attendance Shield of Natural Gas Convention Presented

The Doherty employees won the shield of stars and stripes donated by the Metric Metal Works for the company whose employees had the most mileage to and from the Natural Gas Convention. F. P. Fisher of Bartlesville, Okla., and F. Cosan of the South Shore Natural Gas & Fuel Company of Buffalo, rounded up a total for the Doherty men of 59,718 miles. The shield will be sent to Henry L. Doherty & Company after it has been inscribed.

Worcester Company Gains Business Under Higher Rates

The unusual opportunity of gas companies to secure a rapidly increasing cooking load is being shared by the Worcester (Mass.) Gas Light Company, which is featuring a full line of the Clark Jewel ranges, and the Kompak, Pittsburg and Humphrey gas water heaters. The sale of hot plates of the one and two-burner types is rapidly going forward, reflecting the prevalent demand for small housekeeping equipment for the summer "stay-at-homes."

The Worcester company sells all stoves and water heaters on the instalment plan. For cabinet ranges the price is $3 down and $3 per month, while for tank heaters and hot plates the initial and monthly payments are $2. Larger types of kitchen equipment call for an initial payment of about 20 per cent, with the balance on easy terms.

The company is using with good effect a national package sealer, which delivers a gummed sticker from a roll properly wet, for applying on all packages sold at the small appliance counters. On the stickers is printed in red ink:

"If it uses gas, we sell it. Cook and light with gas.

WORCESTER GAS LIGHT CO.,
Appliance Dept.,
286 Main St."

The rate for gas to domestic users was raised on April 1 from 75 to 85 cents per thousand feet. The consumers have met the increase with good grace, a slight flurry raised at first having faded away, when it became recognized that the greatly increased cost of fuel and oil made such an advance proper and reasonable. With the cost of anthracite coal about 50 per cent above the normal, gas customers cannot but see that an increase of 13 per cent in the price of gas is really only a partial compensation for the increasing costs carried by the gas company.

No petition having been presented to the state gas commission relative to the price increase, the new rate stands. Had a protest been entered, the new price would have had to be adjudicated by the gas commission.

To the CONSUMERS of the

CAMBRIDGE GAS LIGHT CO.

The greatly increased cost of Coal, Oil, all other Materials and Labor during the past year makes **AN ADVANCE IN THE PRICE OF GAS NECESSARY** and the Directors of the Cambridge Gas Light Company have voted an **INCREASE OF TEN CENTS (10c) PER THOUSAND CUBIC FEET, TO TAKE EFFECT ON ALL BILLS RENDERED AFTER JULY 2, 1917.**

Accordingly on all bills rendered after that date, the price of gas will be figured at $1.00 per 1000 cubic feet, with a discount of 10 cents per 1000 cubic feet if the bill is paid within the discount period stated thereon: thus making the net price

90c Per 1000 Cubic Feet

INSTEAD OF

80c Per 1000 Cubic Feet

AS HERETOFORE.

This step is taken with reluctance, and for the purpose of partially meeting the relatively larger increase in the cost of manufacture and distribution, as well as to enable the Company to maintain its customary prompt and efficient service to the community; and we feel confident that the intelligent consumer will recognize the necessity and admit the justice of our action.

The Company's record for **THE PAST TWENTY-FIVE YEARS**, during which time **THE PRICE OF GAS HAS BEEN VOLUNTARILY REDUCED FROM $1.00 TO 80c**, will surely serve as a sufficient guarantee to the public that **THE ADVANCE IS ABSOLUTELY NECESSARY**, and that it **WILL REMAIN IN FORCE ONLY SO LONG AS THE EXISTING ABNORMAL CONDITIONS CONTINUE.**

CAMBRIDGE GAS LIGHT COMPANY

ALBERT M. BARNES, President.

REPRODUCTION OF ADVERTISEMENT OF RATE INCREASE

City to Sell Bonds and Buy Palo Alto Plant

The city council of Palo Alto, Cal., has passed an ordinance providing for the sale of the bonds for the purchase of the property of the Palo Alto Gas Company. Of the $70,000 authorized provision is made for the sale of $49,000 in the general market and for the purchase by the city of $21,000. The city has in its treasury a surplus of cash that will enable it to invest that amount of the bond issue and thereby to secure interest on its funds that it has been impossible to loan to advantage.

According to latest reports bids for the sale of the $49,000 were to be opened on June 25 and as soon thereafter as the sale can be perfected the money will be available for taking over the property and rights of the gas company by the municipality.

Cambridge Company Announces Increase

The advertisement reproduced herewith was inserted by the Cambridge Gas Light Company as a quarter page ad in the daily papers. This is one of the most effective ways of explaining to the public the new rates, and establishing the justice of necessary increases.

Illinois Association Establishes Second Fellowship

We are informed by Horace H. Clark, secretary-treasurer of the Illinois Gas Association that the board of directors have voted for a second fellowship in gas engineering at the University of Illinois. This is to take effect in September, 1917, and will give the Illinois Gas Association two research fellows at the university.

Gas Company at Lexington Features Ruud Heaters

The Lexington (Mass.) Gas Light Company recently featured the Ruud water heater, giving a 10 per cent discount to purchasers installing them in the first weeks of June. A specimen heater was installed in the show window of the new store and office recently opened on Massachusetts Avenue, in the heart of the historic town.

1917 ANNUAL MEETING WELSBACH MANAGERS AND SALESMEN, HELD AT GLOUCESTER, N. J. OVER

Managers and Salesmen of the Welsbach Company Have Annual Meeting at Gloucester, N. J.

Over 100 Men Attended Conference for Discussion of Sales Plans for Coming Year

One of the most interesting meetings since the organization of the Welsbach Company was held in Gloucester, N. J., during the week of May 21. Over 100 managers and salesmen were present, and much was accomplished in the way of discussion of campaign and advertising plans for the advancement of gas lighting during the coming year, as well as the consideration of new products and ideas.

Characterized by enthusiasm and the spirit of co-operation, these "get-together" meetings have always been anticipated with pleasure. This year's meeting was more enthusiastic than any of its predecessors, due, in part, to the tremendous increased production of the new million-dollar factory and the record year, and the new Welsbach lighting ideas for the forthcoming year.

A very interesting set of photographs were obtained, two of which are reproduced herewith. Of the one hundred men included in the large picture, thirty have been with the company over twenty years; nine have been with it since its beginning, nearly thirty years ago. Such long and faithful service speaks eloquently for the co-operation, mutual consideration, perfect understanding between company and employees.

State Objects to Mains Being Laid Over New Bridges

The plan to lay gas mains through the town of Barrington from the East Providence line to Warren, as sought by the Providence Gas Company, is held in abeyance for the present, the State objecting to gas mains being laid across its new bridges over the Barrington and Palmer rivers in Bristol county.

Industrial Plant Makes Attractive Offer to Gas Company

The Framingham (Mass.), Gas, Fuel & Power Company proposes to enter the town of Ashland, Mass., constructing a 3-in. high pressure pipe line a distance of about three miles from the present terminus.

The company is especially attracted by the establishment in Ashland of a plant by the United States Color & Chemical Company, which wishes to use a large amount of gas in processes, and has offered to guarantee a certain income on the cost of the line. In addition to this plant, Manager Jennings hopes to gain about 100 domestic customers.

PHOTOGRAPH OF THIRTY DEPARTMENT AND OFFICE MANAGERS WHO HAVE BEEN IN EMPLOY OF WELSBACH COMPANY TWENTY YEARS AND OVER

ONE HUNDRED ATTENDED THIS, THE MOST INTERESTING MEETING IN THE COMPANY'S EXISTENCE

Ware, Mass., has Increase in Rates

Patrons of the gas department of the Otis Company, Ware, Mass., have received notice of a boost of 25 cents in price on each 1,000 feet of gas for those using under 5,000 feet, the new price being $1.75 a thousand.

Those using over 5,000 and under 10,000 feet will pay $1.50, and those using over 10,000 feet will pay $1.25 a thousand.

The claim is made that cost of labor and coal makes the raise necessary, and that the old schedule will be restored when conditions again become normal.

The Otis Company subscribed $40,000 to the Liberty loan and 615 employees of the company took an equal amount, the company putting in dollar for dollar the amount given by the employees.

$5,750,000 is Liberty Loan Subscription of Consolidated Gas Company of New York

The Consolidated Gas Company subscribed for $5,750,000 of the Liberty bonds through the National City Bank, $750,000 of this application being made for account of over 11,000 of the employees of the Consolidated Gas Company and affiliated companies.

Gas Employees' Benefit Society Formed at Brockton, Mass.

Employees of the Brockton Gas Light Company met in K. of C. Hall recently and formed a sick benefit society to be known as the Brockton Gas Light Employees' Sick and Death Benefit Society. There are 200 employees of the company who will become members of the society. The employees have been organized for some time as a social organization, each member paying dues of 25 cents a month. Members of the new society will pay dues of 50 cents a month and it is hoped to soon have a creditable financial showing.

By-laws and a constitution were adopted. W. P. Morton was elected president. A board of directors was elected as follows: A. A. Wilbur, J. B. Anderson, E. B. Mooney, W. G. Von Genningen, John Sheehan and John Bagge. A meeting of the directors was held later in the evening and John Sheehan was elected vice-president of the society, with John Bagge as secretary and A. A. Wilbur as treasurer. There are several death and sick benefits to be obtained.

The Brockton (Mass) Gas Light Company is installing pipes in West Elm Street, between Warren Avenue and the bridge, in a section where the city is constructing a new road.

New York Company Sells Real Estate Holdings Near Riverside Drive

The Consolidated Gas Company of New York which has been liquidating its vacant holdings in Manhattan, has disposed of another large tract in the vicinage of Riverside Drive, just north of the Fort Lee Ferry viaduct.

The property consists of a plot of thirty-three lots in the block bounded by Broadway, Riverside Drive, between 132d and 133d Streets, all of which is controlled by the selling company with the exception of the Broadway frontage. It has a frontage of 425 ft. in 132d Street, distant 100 ft. west of Broadway, extending through to 133d Street, where the frontage is 400 ft. The plot, 200x250, in the Drive frontage, on which is located one of the company's tanks, is not included in the transaction.

The buyer is reported to be J. J. Maguire, who is said to be acting for the Fifth Avenue Coach Company. At the office of Joseph P. Day, the agent for the gas company, no confirmation of this report could be obtained, but from authentic sources it was learned that the coach company is the actual buyer and that they will erect a garage to care for their constantly growing requirements.

The property is reported to have been held at $350,000.

Plymouth County Company Increases Rates

The Plymouth County Gas, Heat, Light & Power Company which supplies gas for a number of places, among them the towns of Braintree, Rockland, Abington, Whitman and other places, propose to raise their price of gas to commence July 1 from $1.35 to $1.50 per 1,000 cu. ft., with discount as at present if bills are paid within 15 days.

The company has had a conference with the board of gas and electric light commission, but no hearing has been held. The company will meet with opposition from at least some of the towns that it supplies, but to what effect is unknown.

In the permit granted the company as given by the town of Braintree, Section 12 reads as follows: "The net price of gas to consumers, after deducting the discount of 10 cents per 1,000 cu. ft. for payment within 15 days, shall not exceed $1.25 per 1,000 cu. ft. unless the total cost to said company of the materials now used, or which may hereafter be used in the manufacture of gas, is increased more than 15 per cent over the present total cost of the materials now used by the manufacturers of gas; in which case the price charged to consumers shall be only proportionately increased. Nothing herein contained shall be construed as in any way affecting the right of the consumer of gas supplied by said company to petition the board of gas and electric light commission for a reduction in the price charged by said company for gas, nor in any way affecting the right of said customers to hear and determine such petition."

No reply has as yet been made to the company by the selectmen of Braintree.

New York Company Collects Vincent Astor Gas Bill of $1,429

The Consolidated Gas Company obtained judgment in the Supreme Court against Vincent Astor for a gas bill of $1,429. This bill, the company claimed, represented gas consumed in the Astor Market, Broadway and Ninety-fifth Street.

Mr. Astor protested that the bill was too high, when it was presented to him, and refused to pay it. The gas company then brought suit and recovered.

CULTIVATING LAND ALONG TRANSMISSION LINES

Making Use of "Right-of-Way" Property

The active interest which is now being taken by public utility companies in making use of spare land is borne out in the action of the Pennsylvania Water & Power Company. About 15 acres of land are being cultivated by men in the employ of this company in the district of Holtwood, according to an item in the Baltimore Gas & Electric *News*.

The extent of garden ground alongside of the railroad from the station at Piney Island toward the McCall's Ferry Station has been more than doubled this year. All the ground that could be plowed, including an old tennis green, has been converted into gardens.

The management of the Pennsylvania Railroad Company has seen the great opportunity for employees' welfare work in this direction, and has published a pamphlet on "Potato Culture."

Also the land in many parts of the country along transmisson lines which formerly lay idle is now being worked to its fullest extent.

State Warns Ohio Consumers Against Shortage Next Winter

According to the report of G. L. McKibben, gas expert of the public utilities commission, after a statewide survey, there is no hope that Ohio will have an improved gas supply next winter. These findings were recently made public.

M. B. Daly, president of the East Ohio Gas Co., stated some weeks ago that no consumer can depend on gas alone between November 1 and March 1.

In the main what the utilities commission recommended to the thousands of Ohio gas consumers to assure improvement over last winter's condition is:

1. That they be economical in their use of gas.
2. Stop all waste and unnecessary use.
3. Make sure that pipes and connections are not leaky.
4. Lay in a supply of coal to fall back on.
5. Wide publicity of this report to reach the gas consuming public.

The prospects are not bright for normal coal prices next winter, Mr. McKibben also states. Winter prices of a year ago are prevailing this summer and the price is bound to rise again by fall.

Elyria dealers are now selling coal at the special summer prices. Hard coal is selling at ten dollars a ton; coke at nine-fifty, and soft coal from eight to nine-fifty a ton.

Local dealers agree that now is the most opportune time to lay in a supply for winter use. With the gas shortage apparent many people will be forced to burn coal for fuel this winter and those who act quickly will profit by it.

New Well Struck at Quinton, Okla.

The Quinton Oil & Gas Company in which a large number of local men are interested, struck its sixth gas well at Quinton, Okla., according to word received by A. J. Koch from the company's manager, David Nottage. The new well was struck at a depth of 1,100 feet and when fully developed will have a capacity of about 30,000,000 cu. ft. of gas every twenty-four hours.

More Plants to Be Bought by Oklahoma Company

Several gas and electric plants operating in the State of Oklahoma will within the next few weeks be purchased by the Oklahoma Gas & Electric Company, and operated jointly by that concern, according to W. K. Molinard, general manager of the local corporation.

Mr. Molinard declared that the capital stock of the company will be increased from the present amount, $5,100,000, but that he had not been informed by the general offices at Chicago to just what amount the increase would be. He indicated, however, that the authorized capital of the company would be increased to more than $30,000,000.

"It is a fact that officials of the Byllesby Company of Chicago, owners of the Oklahoma Gas & Electric Company are planning to increase their holdings extensively in this State," said Mr. Molinard.

"To meet the expansion the capital stock will be greatly increased and several gas and electric plants now in operation in the State will be merged into the one company, all operating under the name of the Oklahoma Gas & Electric Company, because the name is appropriate.

"Two members of the legal department of the home office at Chicago are here working out the expansion plans, but I know but little of them, having my hands full with the local business."

It is said that the gas companies serving Tulsa, Muskogee, Shawnee and Guthrie will be among the plants that will be taken over by the Chicago capitalists.

Louisville to Have Heating Appliance Factory

The magnetism of Louisville's Million Dollar Factory Fund has been exerted for the benefit of the city by the Louisville Industrial Foundation, and as a result the Hart Manufacturing Company, a concern which has been doing an extensive manufacturing business in Grand Rapids, Wis., will be removed to Louisville. Announcement of that fact was made recently by Tampton Aubuchon, general manager of the Foundation. It was also reported that five carloads of machinery of the Hart Company now are en route to Louisville, and the plant will be in operating condition within a few weeks. A factory building has been secured at Fifteenth and Madison streets.

The payroll of the Hart Company will aggregate $50,000 a year. Forty skilled mechanics who have been employed at the Wisconsin plant will come to Louisville to continue the work there. The entire business of the Wisconsin plant will be taken over by the Louisville concern, which will have representatives all over the United States.

The Hart Company recently was incorporated in Kentucky with a capital stock of $60,000. A. E. Hart is president. P. E. Gordon, of the Merchants' Wholesale Grocery Company, Louisville, is vice-president. The other officers are H. K. Cole, secretary of the Central School Supply Company, secretary-treasurer, and C. E. Olsen, of the Peters & Volz Company, Arlington Heights, Ill., general sales manager. The concern manufactures heating and ventilating systems for school rooms, theaters, railroad stations and other public buildings. Recently the Hart Company secured a Government contract for $42,000 worth of work, including the making of 64,000 joints of pipe and 1,000 field ovens. The company also manufactures portable drinking fountains used in places where city water pressure is not available, and also sanitary drinking systems for factories.

A. E. Hart, president of the firm, has been negotiating with the Louisville Industrial Foundation for the past two months.

Colorado Company Reports Unusual Business

"The present year seems to be an unusual one and the sales since January 1 have been abnormally high due to general business conditions, and also to the increased price of coal for domestic use," is a statement made by F. H. Ripley, superintendent of the Greeley Gas & Fuel Company of Greeley, Colo.

In anticipation of an even greater increase in sales for the coming summer months this company has just completed the storage of a six months' gas coal supply from the Southern Colorado fields.

The demand for by-product coke also has been strong, one concern at Council Bluffs, Iowa, having requested three car-loads of the product, of which one has already been sent.

Personal Notes

Samuel J. Dill Dead

Samuel J. Dill, vice-president of the United Gas & Electric Engineering Corporation, died at his home in Jamaica, Long Island, Thursday, June 14.

Mr. Dill was born in Walkill, New York, Oct. 3, 1864. In his early days he was connected with the Pennsylvania, New York, New Haven & Hartford and West Shore railroads. Later he went with the Staten Island Rapid Transit Company, and still later associating himself with the Metropolitan Street Railway Company of New York City. After this he became superintendent of the Forty-second Street and Manhattanville Railroad. He held this position at the time the street railways of New York City abandoned the cable car system and adopted electric traction.

From New York, Mr. Dill went to Ypsilanti, Mich., as general manager of the traction company and later held like positions in Kalamazoo, Mich., and Youngstown, Ohio. It was in 1908 that he became associated with the Susquehanna Railway, Light & Power Company, when he was appointed general manager of the Elmira Water, Light & Railroad Company, one of its subsidiaries. From there he was transferred to New York as assistant to the president of the Susquehanna Railway, Light & Power Company, upon the reorganization of which he was made vice-president of The United Gas and Electric Corporation and also held the office of vice-president and director of many of its subsidiary companies. During the past year he devoted all of his time and energy to the oil developments in the Oklahoma field.

There is no man in the gas, electric and street railway fraternity who has a wider circle of friends and acquaintances than had Mr. Dill. This was in part due to his extreme geniality and approachability, and he enjoyed the confidence of his many friends because of his attitude of justice and fair play to all with whom he came in contact. There are few men whose loss will be so keenly felt by as many close friends as is that of Mr. Dill.

Engineer Appointed on School Board

A. R. McArthur has been appointed a member of the School Board of Gary, Ind., to succeed Geo. M. Hunter. The Gary schools are known throughout the whole country as the originator of the "Model School System," and the Gary Chapter of the American Association of Engineers, through their chairman, Gerard C. Dooge, have commended the City Council of Gary for the selection of an engineer on this board.

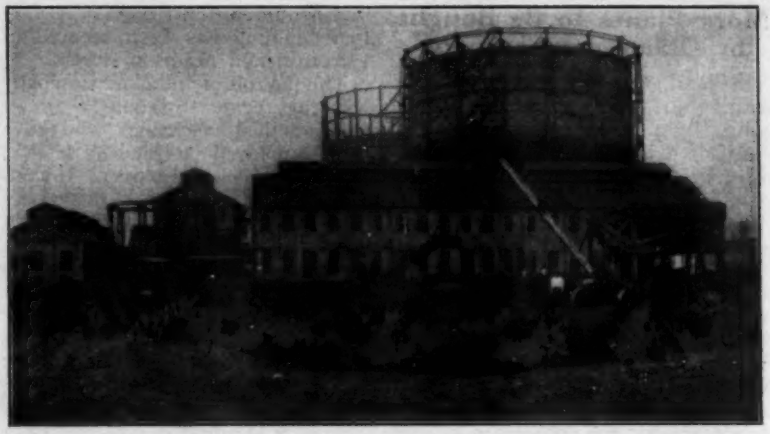
It is obvious that the inherent qualities which an engineer must have, together with the subsequent education and training which permits no hasty action, will prove to be a valuable asset to the School Board and a lasting monument to the council of a city for their judgment in the selection of men to do work of this kind.

J. F. REYNOLDS is now the manager in charge of the industrial division of the Consolidated Gas Company of New York. Mr. Reynolds has been with the Consolidated company for many years, part of this time having been spent as one of their outside industrial men. He now has charge of both the inside and outside work.

R. W. CURRAN, formerly of the South Shore Natural Gas & Fuel Company of Buffalo, was tendered a dinner recently in that city just before he left to begin his duties at the Trumbull Public Service Company of Warren, Ohio.

GENERAL MORRIS SCHAFF was recently reappointed a member of the Massachusetts Gas & Electric Light Commission. Although he is seventy-six years of age his mental vigor is unimpaired and he is regarded as an authority on gas, electric light and power regulation. He has been a member of the commission since 1893.

SIDNEY W. WINSLOW, president of the United Shoe Machinery Company, died June 18, 1917 at his summer home, 545 Cabot Street, North Beverly, Mass. Mr. Winslow made a small fortune by reorganizing the Beverly Gas Company as the Beverly Gas & Electric Company. He bought stock of the company, which was practically worthless, at very low prices and finally gained control of it. The stocks soared in value and it was soon a dividend-paying proposition.



VIEW SHOWING PURIFYING HOUSE NO. 1, AND CLEARING GROUND FOR HOUSE NO. 2

Construction Notes

Work Progressing on New Purifying House at Spring Gardens (Balt.) Station

In order to handle the increased quantity of coke oven gas which the Consolidated Gas, Electric Light & Power Company will obtain from the plant of the Bethlehem Steel Company at Sparrows Point, it was necessary to provide additional facilities at Spring Gardens Station for purifying the gas.

According to an article which appeared in the Baltimore Gas & Electric *News*, written by George Beadenkopf, to meet the situation a purifying house 222 ft. long by 90 ft. wide is being constructed, with concrete foundation, brick walls and slate roof. This house when completed will contain 60 purifying boxes, 21 x 35 x 12 ft. deep each. The boxes have 30-in. connections, and the capacity of each is 6,000 bushels of oxide.

An illustration, showing the old purifying house and the foundation work being done on the new one, is shown herewith.

This installation when completed will constitute probably as large a single purifying house installation as any in the country, and will double the present purifying capacity of the company.

The Consolidated Engineering Company of Baltimore is the contractor for the erection of the building. The Chesapeake Iron Works of Baltimore is furnishing the steel structural work, and the Bartlett-Hayward Company of Baltimore is furnishing the 16 purifying boxes, complete with valves, connections and traveling crane.

The Robins Conveying Belt Company of New York is furnishing the oxide conveyor. The purifying trays are being furnished by W. D. Gosnell of Baltimore.

The engineering work on this installation is being handled by the Gas Engineer's Department, through W. R. Puryear, A. Loeser and W. F. Railing.

Contract Awarded for New Waterbury Plant

The Tracy Bros. Company has been awarded the contract for the construction of a gas plant in South Waterbury for the Waterbury Gas Light Company, E. H. Williams, vice-president and general manager. The plant will be constructed of concrete and as yet none of the subcontracts, with the exception of some gas-making machinery, have been awarded. In connection with the buildings to be erected, a trestle, 125 feet long, of wood, will be built.

Pipe Line Construction Held Up by Commission

Word from San Francisco is to the effect that the final submission of the Central California Gas Company's application for authority to construct a natural gas transmission line was deferred by Railroad Commissioners Devlin and Loveland recently. The commissioners intimated that if the bondholders of the company elect to waive default of payment of sinking fund obligations and do not foreclose on the properties that the commission will consider the application upon its merits.

NOTE:—

This advertisement is only to keep
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U. G. I. Vertical Retorts

The best system of coal carbonization
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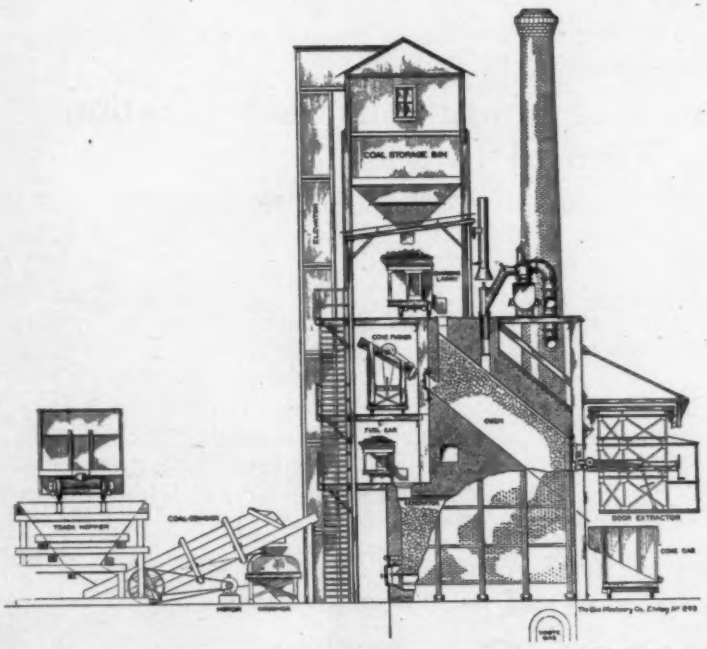
Figures prove this and the guarantees of

THE UNITED GAS IMPROVEMENT CO., Philadelphia

Back it up



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PLANTS 350,000 DAILY AND LARGER

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Gas Ovens

ONE PLANT OPERATING

3,000,000 Cubic Feet Daily
under Construction

Advantages:

Low First Cost
Minimum of Labor
Twelve-Hour Carbonization
Two Eight-Hour Shifts
Low Maintenance
Highest Efficiency

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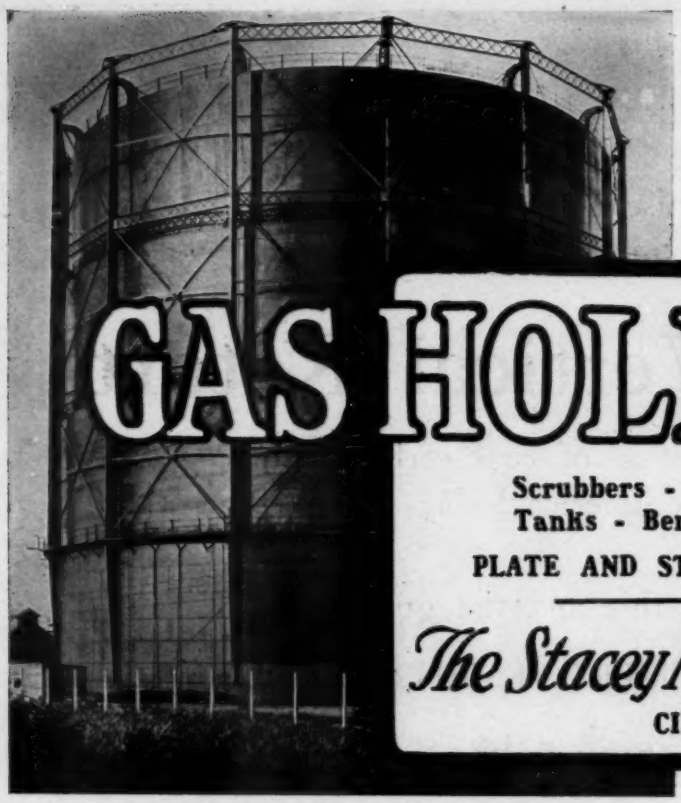
CLEVELAND OHIO



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Tanks - Bench Iron Work - Valves
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MR. GAS MANUFACTURER

It is tremendously vital to your interest to immediately investigate the following distinct advantages possessed by an installation of

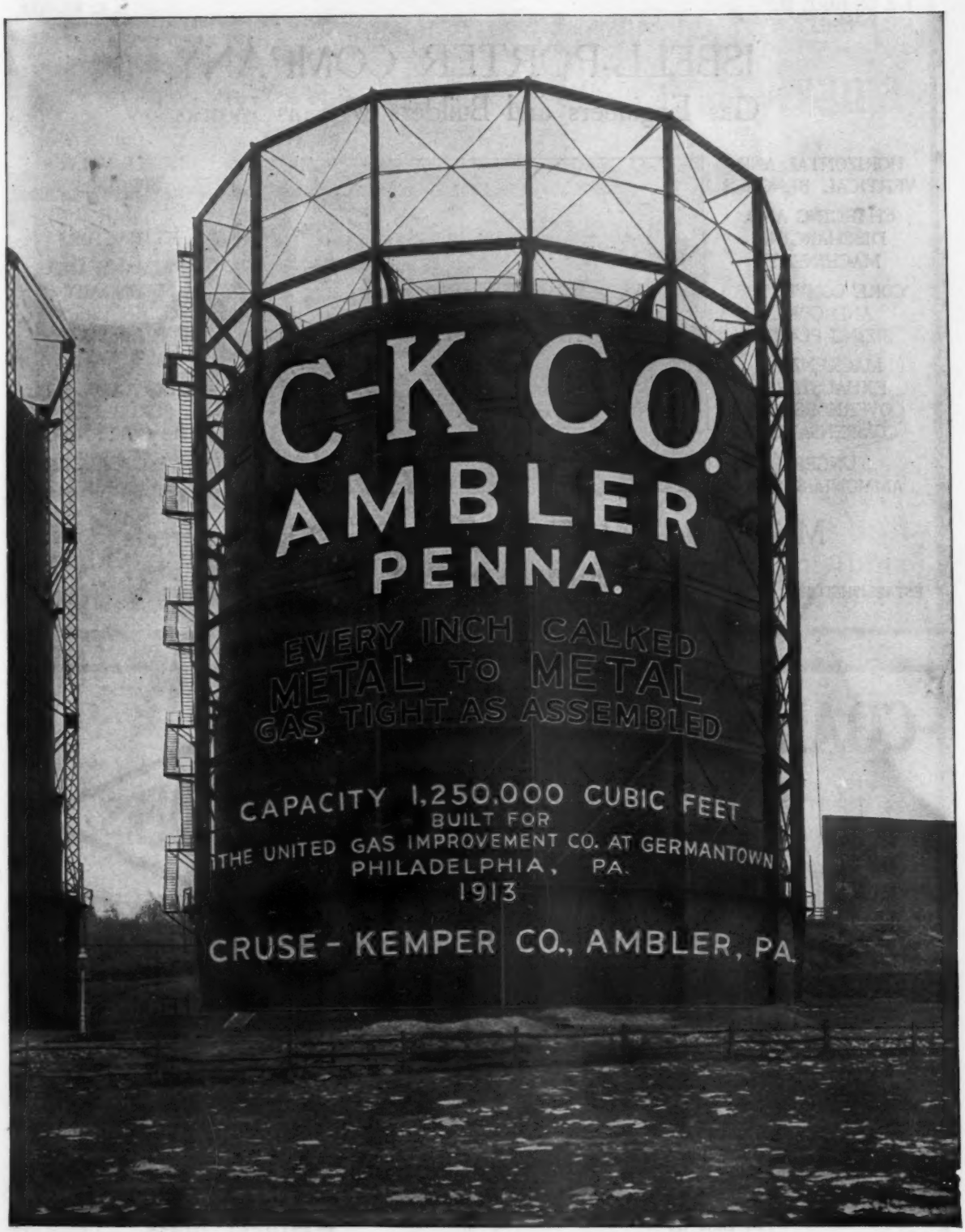
Glover-West System of Continuous Carbonization in Vertical Retorts

Do you know that WATER GAS can be PRODUCED and ENRICHED in this type retort with our patented enriching device, cutting out costly operation of water gas sets in localities demanding a high candle power gas.

Think of a plant capable of producing **250,000** cubic feet per man per 12 hours, on minimum area, where the coal is fed direct and continuously by gravity from overhead bunkers eliminating the hot and laborious job of intermittently charging retorts by hand, producing the largest yield of uniform composition gas of constant candle-power and heating value per ton of coal carbonized, utilizing heat of residual coke so that coke is discharged in a cool state, eliminating all smoke, dust and steam nuisance, a plant with great flexibility of output by just varying travel of coal through retorts. No plant has too small a productive capacity, as system can be built in units as small as 125,000 cubic feet per diem.

These facts are absolute fortification against labor difficulties
Think it over and let us send you further particulars

Engineers Contractors **DIDIER-MARCH CO.,** PERTH AMBOY NEW JERSEY Manufacturers of High Grade Refractories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EVERY INCH CALKED
METAL TO METAL
GAS TIGHT AS ASSEMBLED
CAPACITY 1,250,000 CUBIC FEET
BUILT FOR
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CHARGING AND DISCHARGING MACHINERY

COKE CONVEYORS AND COKE SIZING PLANTS

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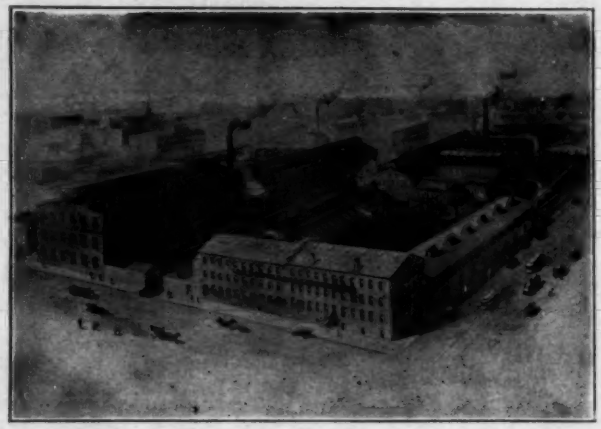
UNGER AMMONIA STILLS



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Gas under three pounds pressure, used in connection with our High Pressure gas lamps, PRODUCES 27,620 candle power more from every one thousand cubic feet of gas consumed, than is received from each one thousand cubic feet of gas used in low pressure burners.

We are prepared to convince you of the truth of this; write to us to-day for full information.

By the use of these efficient units you will be in a position to compete with your competitors who are securing the lighting by furnishing large illuminating units, which in some cases are demanded.

We will be pleased to inform you on this important branch of the gas industry if you will write us.

The Pennsylvania Globe Gas Light Company of Philadelphia

1934 Market Street - - - - - - - - Philadelphia, Pa.

The "C-C" PILOT Lighter

The New Welsbach Pilot Light That Will Not Blow Out

A Great Step Forward in the History of Gas Lighting

A pilot light tipped with a small bundle of non-combustible fibres, which enmesh the flame, sheltering it against drafts.

Gives a useful incandescent glow that guides you through darkness to the fixture.

Consumes about half the gas used by the old style pilot.

An Exclusive Welsbach Feature now furnished with "C.-E-Z" Lights and Welsbach Kinetic Gas Bowls.

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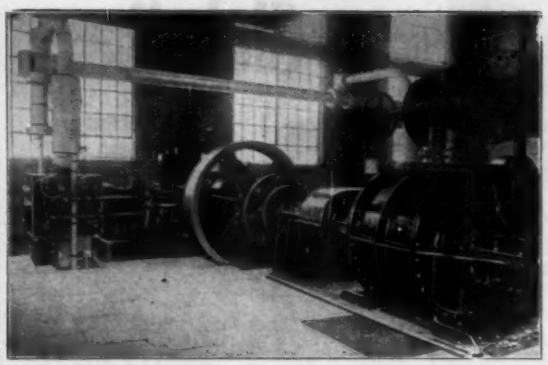

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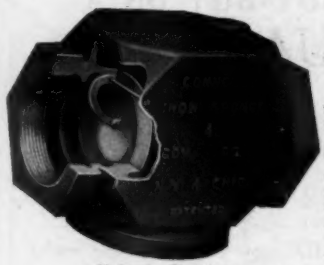

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For use on lines using boosted air pressure.

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on your high pressure lines will prevent all trouble and a positive gas-tight check to any back pressure or reverse flow of gas —acts automatically—sensitive to the slightest impulse—easily accessible.

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Anything and everything for the manufacture and distribution of gas

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Just put it up to a "BROWN" Recording Thermometer, and you can read the *true* story from a clean-cut chart record. This instrument takes care of anything up to 800° F.

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Have back of them the same stability, long life and accuracy that have placed "BROWN PYROMETERS" in over 80 per cent of the gas plants in this country.

Let us tell you what "Browns" are doing for others, so you will know better what they will do for you.

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But she brings you safely home. And you say, "Old Aunt Betsy is surely some car."

And then next week (or next month) as you go rolling down the asphaltum away goes an axle or some other part.

Your automobile was weakened by the overstrain in the mud and let go at her leisure when there was no strain.

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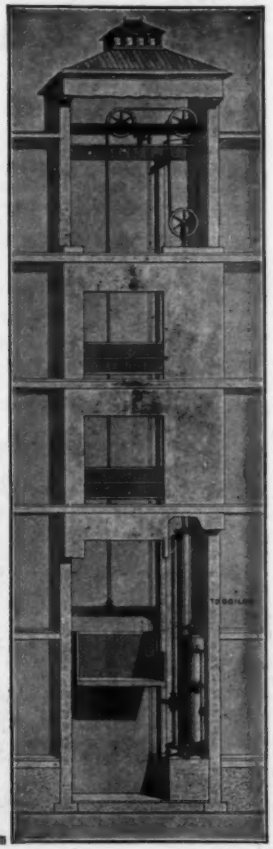

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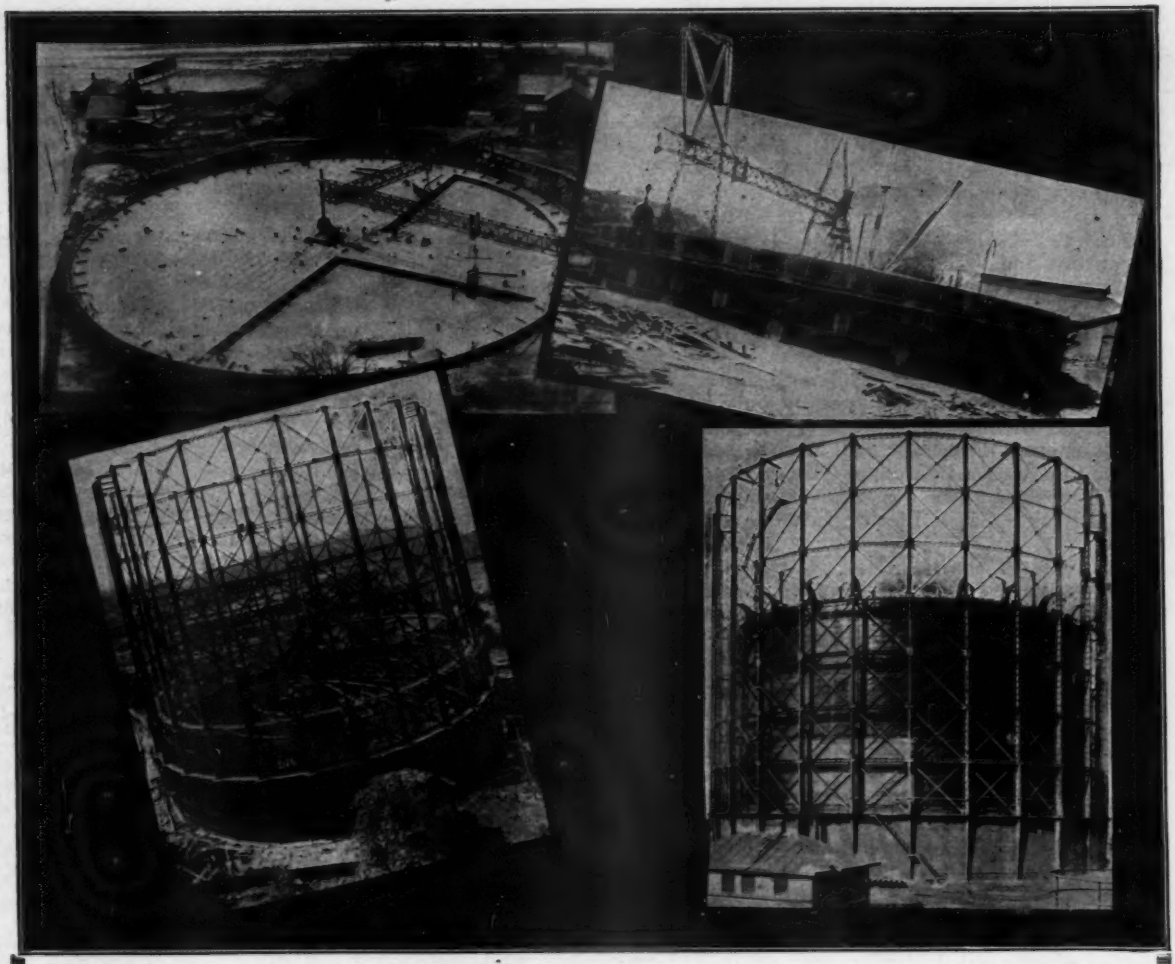

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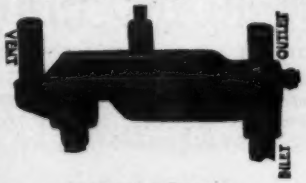

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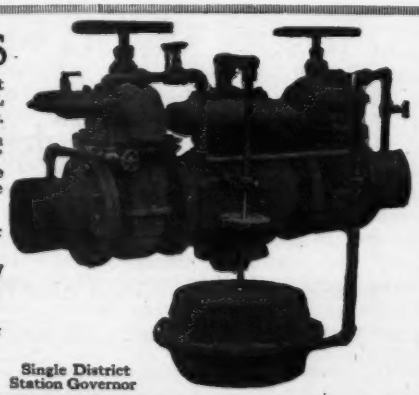

Single District
Station Governor

Financial Notes

THE OKLAHOMA GAS & ELECTRIC COMPANY, a subsidiary of the Standard Gas & Electric Company has issued to William P. Bonbright & Company and H. M. Byllesby & Company, underwriters, $2,250,000 two-year 6 per cent. gold notes. The proceeds are to be used to retire the company's outstanding 6 per cent. debenture bonds. The company has made arrangements to acquire the properties of the Enid Electric & Gas Company, the electric light business in the town of Norman, Okla., and control of stock ownership of the Muskogee Gas & Electric Company.

THE CITIES SERVICE COMPANY'S gross earnings for the five months ended May 31, 1917, exceeded the figures for the full twelve months ended May 21, 1916, by nearly two and one half million dollars.

The gross earnings for the five months, $8,432,238, were over 2½ times greater than for the comparative months last year, and the balance for the common stock, $6,814,684, was over three times greater, and at the annual rate of nearly 70 per cent on the amount of common stock outstanding in the hands of the public on May 31, 1917.

The gross earnings for the twelve months ended May 31, 1917, were $15,218,273, thus surpassing the results for the twelve months ended April 30, 1917, the previous record period, by over $850,000. These figures were 2½ times greater than for the preceding year. The balance for the common stock was $11,850,441, or over 3⅓ times greater, and equivalent to 53½ per cent on the common. It is interesting to note that 78 per cent of the gross earnings of Cities Service Company in this period was available to the common stock, all expenses, interest and preferred dividend requirements having previously been deducted.

The margin of earnings available to the payment of preferred dividends as compared with the dividend requirements is constantly widening, and the stock thereby becomes consistently stronger. For the twelve months ended May 31, 1917 the preferred dividend was earned practically five times. This compares with three times in the preceding year.

On May 31, 1917, the total surplus and reserves of Cities Service Company was $17,013,135 as compared with $7,211,551 on May 31, 1916, and $221,929 at the end of the first year's operations of the company, less than six years ago.

In accordance with the policy of reinvesting surplus earnings in the properties, the total earnings thus available as of May 31, 1917, were $20,725,557.

During the month of May the sales of crude oil increased over the previous month and the refineries were operated at full capacity. The Public Utility revenues are showing their normal declines with the approach of summer and consequent longer periods of daylight.

Below is a comparative earnings statement:

	12 Mos. Ending May 31, 1917	12 Mos. Ending May 31, 1916	Month of May, 1917	Month of May, 1916
Gross Earnings	$15,218,272.65	$6,012,968.67	$1,565,425.54	$709,085.22
Expenses	287,038.12	201,343.52	28,340.63	20,112.59
Net Earnings	$14,931,234.53	$5,811,625.15	$1,537,084.91	$688,972.63
Interest on Notes and Debentures	42,624.37	503,453.85	234.52	44,120.89
Net to Stock	$14,888,610.16	$5,308,171.30	$1,536,850.39	$644,851.74
Dividends Preferred Stock	3,038,169.65	1,759,547.42	299,124.50	171,355.00
Net to Common Stock and Reserves	$11,850,440.51	$3,548,623.88	$1,237,725.89	$473,496.74

Contingent Fund	$734,186.23
Surplus Reserve	2,329,668.04
Stock Surplus	5,565,505.00
Surplus	8,383,775.34
Total Surplus and Reserves	$17,013,134.61

Number of times Preferred Dividend was earned	4.90	3.02
% Earned on average amount of Common Stock outstanding	53.48%	21.98%

THE STANDARD GAS & ELECTRIC COMPANY is advertising for tenders, through the Philadelphia Trust Company, of its convertible 6 per cent. sinking fund gold bonds maturing Dec. 1, 1926, to absorb $67,510.44 now available in the sinking fund, tenders to be received until 3:00 p. m., Friday, July 6.

THE NORTHERN STATES POWER COMPANY reports that during the month of May, 188 customers in the territory it serves purchased $82,500 worth of the 7 per cent. preferred stock of the company, making a total of $1,652,100 of this issue held by 3,298 shareholders.

THE BARNETT OIL & GAS COMPANY has declared a regular quarterly dividend of 1 per cent, together with an extra of 1 per cent, both payable Aug. 1, to stock of record July 15.

THE GRAYSON COUNTY OIL & GAS COMPANY, in which prominent Moline and East Moline men are interested, has increased its capital stock from $50,000 to $500,000.

THE GASTONIA SUBURBAN GAS COMPANY OF RICHMOND, VA., has been incorporated, with $100,000 capital stock. This new concern is backed by Philadelphia money and energy. Gas works of ample capacity for Gastonia and suburbs will be established.

THE CENTRAL CITY GAS COMPANY, whose headquarters are at Hastings, Neb., has been granted a permit by the State Railway Commission to issue $10,000 of common stock for the purpose of making improvements. The stock must be sold at par. The company asked for authority to issue $12,500.

THE LINDSAY LIGHT COMPANY reports for the fiscal year ended May 31, 1917, net profits amounting to $431,003, an increase of $228,883 over last year. Allowing for 7 per cent dividends on the preferred stock, the amount applicable to the common was equivalent to $6.71 a share, compared with $2.90 a share the previous year.

Total assets as of May 31, 1917, were given as $1,420,590, which included $319,239 in receivables and $158,733 in cash. Balance sheet surplus amounted to $366,414.

THE WESTERN POWER COMPANY OF CANADA, LTD., Vancouver, B. C., reports operating revenues for May, 1917, of $38,205, an increase of 36 per cent over the previous May, and net earnings of $27,430, an increase of 34 per cent over May, 1916; for the year the increase was 40 per cent.

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Our Special Interest in helping gas men to find the position best suited to them has developed into a **"Service."**

Learn More About It

American Gas Engineering Journal

Office of

The United Gas Improvement Co.

N. W. Corner Broad and Arch Streets.
Philadelphia, June 13, 1917.

The Directors have this day declared a quarterly dividend of two per cent. ($1.00 per share), payable July 14, 1917, to stockholders of record at the close of business June 30, 1917. Checks will be mailed.

I. W. MORRIS, Treasurer.

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to obtain the Proceedings of several gas associations at a low cost.

Are the ones you need among this list?—

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Description and edition dates furnished when you write.

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AMERICAN GAS ENGINEERING JOURNAL

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The Connersville Valveless Rotary Pump, by reason of its simple design and rugged construction, is unique in the field of pumping benzol, tar, straw oil, liquors, etc.

The Pump has been built since 1893 and has a splendid record for efficient, dependable service. It must not be confused with gear pumps, as it possesses no points in common with them, a matter worth mention here, since many inquirers have voiced the disappointment they have experienced with gear pumps.

To meet the peculiar demands of benzol pumping we have recently brought out a complete line of pumps especially designed for that service.

Particulars on Request.

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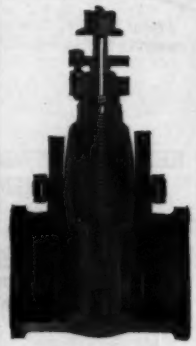

These Valves are tapped each side of gate to receive tube to which a gauge is attached indicating if any leak occurs.

NO LEAKS LOSS

With Test Tubes

because you can determine and locate leaks with

SURETY

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The LUDLOW

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The power to operate this governor is derived from two diaphragms of equal area, moving in opposite direction, but transmitting their power in the same direction. The lower or primary diaphragm is connected to, and exerts its power directly to, the main valve stem. The upper or secondary diaphragm is connected to, and exerts its power directly to the main lever at such a distance from its fulcrum as to multiply it several times, thus practically increasing the diaphragm surface four or five times, and increasing the power of the governor to control the valves to that extent.

Send for our 52-page illustrated catalog. Over 30 years making Gas Regulators.

The Chaplin-Fulton Manufacturing Company

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1934 Market Street :: :: :: Philadelphia

Established 1858 *Incorporated 1890*

CHAS. E. GREGORY, President — DAVID R. DALY, Vice-President and Treasurer — H. D. ABERNETHY, Secretary

J. H. GAUTIER & CO.

Jersey City, N. J.

COAL GAS BENCHES

Silica Retorts and Settings

Clay Gas Retorts Fire Brick

Water Gas Linings, etc.

GOODMAN STOPPER

The Half Minute

GAS MAIN SHUT-OFF

AWARDS

A SILVER MEDAL, St. Louis, 1904

A GOLD MEDAL, San Francisco, 1915

MANUFACTURED AND SOLD BY Safety Gas Main Stopper Co.

90 Alexander Avenue, near 133rd Street, New York

"EVERYTHING FOR A GAS PLANT"

The Western Gas Construction Co.

Fort Wayne, Ind.

No Work Too Special

No Demands Too Exacting

LET US SERVE YOU

GEROULD'S IMPROVED RETORT CEMENT

The Old Reliable

A cement of great value for patching retorts, putting on mouthpieces, making up all bench-work joints, lining blast furnaces and cupolas. This cement is mixed ready for use. Economic and thorough in its work. Fully warranted to stick.

Price List, f.o.b. THOMPSON, CONN.

In Casks, 400 to 800 pounds, at 5 cents per pound
In Kegs 100 to 200 " " 6 " " "
In Kegs less than 100 " " 7 " " "

C. L. GEROULD • THOMPSON, CONN.

What Advertisers Offer to Readers

Classified Index of Products of Representative Manufacturers and Dealers Advertising in this Issue.

See Index page 18 for Manufacturers' Advertisements of Products Listed here

Ammonia Concentrators
Bartlett-Hayward Co.
Gas Machinery Co.
Isbell-Porter Co.
Michigan Ammonia Works.
Western Gas Construction Co.

Apparatus
See Coal Gas Plants.
Conveyors.
Stoking Machinery.
Water Gas Plants.

Arc Lamps
See Lamps.

Backfillers
Parsons Co., The.

Bags
Gas
American Meter Co.
Connelly Iron Sponge & Gov. Co.
See also Stoppers.

Benches
Complete
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Didier-March Co.
Gardner, Jr., Co., James.
Gas Machinery Co.
Gautier & Co., J. H.
Improved Equipment Co.
Isbell-Porter Co.
Missouri Firebrick Co.
Parker-Russell Mining & Manufacturing Co.
Russell Engineering Co.
Stacey Brothers Gas Contr. Co.
Western Gas Construction Co.
Wood & Co., R. D.

Bench Iron Work
Stacey Manufacturing Co., The.

Benzol
Iron Hydroxide Co.
Wetern Gas Construction Co.

Blast Furnaces
American Gas Furnace Co.

Blowers
See Exhausters.

Boiler Graphite
Dixon Crucible Co., Joseph.

Books
American Gas Engineering Journal.

Burners
Fuel
American Gas Furnace Co.
Connelly Iron Sponge & Gov. Co.
Crane Co., Wm. M.

Burners
See Lamps.
Crane Co., Wm. M.
Miner, Thos. T. W.
Wiederhold Mantle Co.

Buildings
Steel Frame
Cruse-Kemper Co.

By-Product Plants
Koppers Co., H.
Western Gas Construction Co.

Calking Tools
Connelly Iron Sponge & Gov. Co.
Sullivan Bros.
United Lead Co.

Calorimeters
American Meter Co., Inc.
Connelly Iron Sponge & Gov. Co.

Carbonic Acid Extractors
See Purifiers, Scrubbers.

Cast Iron Pipe
Cast Iron Pipe Publicity Bureau.
American Cast Iron Pipe Co., The
Clow & Sons, James B.
Donaldson Iron Co.
Glamorgan Pipe & Foundry Co.
Lynchburg Foundry Co.
Massillon Iron & Steel Co.
R. D. Wood & Co.
U. S. Cast Iron Pipe & Foundry Co.
Warren Foundry & Machine Co.

Cements
Gautier & Co., J. H.
Gerould, C. L.
Russell Enginering Co.

Chamber Ovens
Russell Engineering Co.
Stacey Bros. Gas Constr. Co.

Charging Machinery
Davis & Farnum Mfg. Co.
Isbell-Porter Co.
Parker-Russell Min. & Mfg. Co.
Stacey Manufacturing Co., The.

Checker Brick
Parker-Russell Min. & Mfg. Co.
Maurer & Son, Henry.

Clocks
Foxboro Co., Inc.

Coals
Berwind-White Coal Mining Co.
Westmoreland Coal Co.

Coal Gas Apparatus
Bartlett-Hayward Co.
Davis & Farnum Mfg. Co.
Gas Machinery Co.
Improved Equipment Co.
Isbell-Porter Co.
Riter-Conley Mfg. Co.
Stacey Bros. Gas Constr. Co.
Stacey Manufacturing Co., The
United Gas Improvement Co.
Western Gas Construction Co.

Coal and Coke Handling Machinery
Isbell-Porter Co.
Parker-Russell Min. & Mfg. Co.
Keller, C. M.

Cocks
Lamp
American Meter Co.
Crane Co., Wm. M.
Thos. T. W. Miner.
Service
American Meter Co., Inc.
Meter & Service
American Meter Co.

Cookers
See Ranges.

Coke Crushers
Bartlett-Hayward Co.
Beaumont Co., R. H.
Keller, C. M.

Coke Ovens
Koppers Co., H.
Parker-Russell Min. & Mfg. Co.

Computers
Low Pressure
Cox—Amer. Gas Eng. Journal.
Fox—Amer. Gas Eng. Journal.
High Pressure
Cox—Amer. Gas Eng. Journal.

Condensers
See Purifiers.

Conveyors
Bartlett-Hayward Co.
Beaumont Co., R. H.
Davis & Farnum Mfg. Co.
Gas Machinery Co.
Isbell-Porter Co.
Mead-Morrison Mfg. Co.
Stacey Bros. Gas Constr. Co.
Stacey Manufacturing Co., The.
Western Gas Construction Co.

Counters
Foxboro Co., Inc.

Elevators
Craig Ridgway & Sons.

Engineers
Combustion
Improved Equipment Co.
Surface Combustion Co.
Consulting
Baehr, W. A.
Barrett, William E.
Byllesby & Co., H. M.
Humphreys & Miller.
Improved Equipment Co.
Lea, Henry I.
Polk, Roger W.
Randolph, Wm. W.
Contracting
Barrett, William E.
Bartlett-Hayward Co.
Beaumont Co., R. H.
Cruse-Kemper Co.
Davis & Farnum Mfg. Co.
Didier-March Co.
Forstall & Robison.
Gas Machinery Co.
Improved Equipment Co.
Isbell-Porter Co.
Lea, Henry I.
Mead-Morrison Mfg. Co.
Parsons Co., The.
Polk, Roger W.
Riter-Conley Mfg. Co.
Russell Engineering Co.
Stacey Bros. Gas Constr. Co.
Stacey Manufacturing Co., The.
Sullivan Brothers.

RUSSELL ENGINEERING COMPANY
SAINT LOUIS, MO.
COAL GAS BENCHES
COMPLETE COAL CARBONIZATION PLANTS

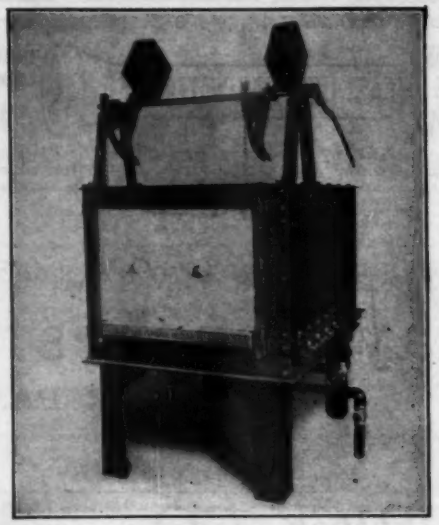
JOHN D. ORMROD, Pres. J. G. EBERLEIN, Sec'y & Treas.
EMAUS PIPE FOUNDRY
CAST IRON GAS & WATER PIPE
DONALDSON IRON CO. EMAUS, PA.
Manufacturers of CAST IRON PIPE AND SPECIAL CASTINGS FOR WATER AND GAS, also FLANGE PIPE and FITTINGS for same.

WE SOLICIT YOUR INQUIRIES FOR EITHER
Silica or Fire Clay Benches
JAMES GARDNER, JR., COMPANY, BOLIVAR, PA.

JOHN DELL, *President and General Manager*
MISSOURI FIRE BRICK CO.,
ESTABLISHED 1882
— MANUFACTURERS OF —
Gas Retorts, Bench Settings, Fire Brick, Cupola Linings, Etc.
We are the Exclusive Agents *for the* Mitchell Patent Benches, *Constructed with Half or Full Depth Furnaces, to Burn either Coal or Coke, and Arranged for Front or* Rear Clinkering. The Mitchell *is the* Original Coal Firing Bench. *We also Erect Plain Benches with* One *to* Six Retorts.
YOUR CORRESPONDENCE IS RESPECTFULLY SOLICITED.
City Office: *411 Olive Street, Continental Bank,* ST. LOUIS, MO.

S. Pemberton Hutchinson, President H. C. Adams, Vice-President George McCall, Treasurer C. B. Nichols, General Sales Agent
THE WESTMORELAND COAL COMPANY
CHARTERED 1854
Mines Situated on the Pennsylvania and the Baltimore and Ohio Railroads, in Westmoreland County, Pa.
POINTS OF SHIPMENT: PHILADELPHIA, BALTIMORE, SOUTH AMBOY, N. J.
Since the commencement of operations by this Company its well-known Coal has been largely used by the Gas Companies of New England and the Middle States, and its character is established as having no superior in gas-giving qualities, and in freedom from sulphur and other impurities.
PRINCIPAL OFFICE 224 SOUTH THIRD STREET, PHILADELPHIA, PA.

The Stacey Brothers Gas Construction Co.
ENGINEERS AND MANUFACTURERS
Gas Holders
Complete Gas Plants
NATIONAL CHAMBER OVEN INSTALLATIONS
STATION P CINCINNATI



Oven Furnace for Hardening or Annealing.

RESULTS COUNT

AMERICAN GAS FURNACES and HEATING MACHINES give results THAT COUNT.

THEY are ECONOMICAL to operate.

Give uniform temperatures of the material, a larger and better Product, and have many other advantages over other makes.

A Trial of any of our APPLIANCES will convince you.

AMERICAN GAS FURNACE CO.

GAS ENGINEERS AND MANUFACTURERS

24 John Street New York City

PUBLIC LIGHTING TABLE

MOONLIGHT SCHEDULE

JUNE 1917

Day of Week	Date	Light		Extinguish
Friday	1	1.10 A. M.		3.30 A. M.
Saturday	2	1.40		3.30
Sunday	3	2.20		3.30
Monday	4	No Lighting		No Lighting
Tuesday	5	No Lighting	F. M.	No Lighting
Wednesday	6	No Lighting		No Lighting
Thursday	7	8.00 P. M.		10.40 P.M.
Friday	8	8.00		11.20
Saturday	9	8.00		11.50
Sunday	10	8.00		12.20 A.M.
Monday	11	8.00	L.Q.	12.50
Tuesday	12	8.00		1.20
Wednesday	13	8.00		1.50
Thursday	14	8.00		2.20
Friday	15	8.00		3.00
Saturday	16	8.00		3.30
Sunday	17	8.00		3.30
Monday	18	8.00		3.30
Tuesday	19	8.00	N.M.	3.30
Wednesday	20	8.00		3.30
Thursday	21	8.00		3.30
Friday	22	8.00		3.30
Saturday	23	8.00		3.30
Sunday	24	9.30		3.30
Monday	25	9.50		3.30
Tuesday	26	10.10		3.30
Wednesday	27	10.40	F.Q.	3.30
Thursday	28	11.10		3.30
Friday	29	11.40		3.30
Saturday	30	12.10 A.M.		3.30

What Advertisers Offer to Readers

See Index page 18 for Manufacturers' Advertisements of Products Listed here

United Gas Improvement Co.
Western Gas Construction Co.

Enrichers
See Oil.

Excavators
Parsons Co., The.

Exhausters
American Gas Furnace Co.
Connelly Iron Sponge & Gov. Co.
Connersville Blower Co.
Davis & Farnum Mfg. Co.
Gas Machinery Co.
Isbell-Porter Co.
Roots Co., P. H. & F. M.
Western Gas Construction Co.

Firebrick
Didier-March Co.
Gardner, Jr., Co., James.
Gas Machinery Co.
Gautier & Co., J. H.
Improved Equipment Co.
Maurer & Son, Henry.
Missouri Firebrick Co.
Parker Russell Mining & Manufacturing Co.
Russell Engineering Co.
Union Mining Co.

Fittings
See Pipe.

Fixtures
General Gas Light Co.
Pennsylvania Globe Gas Lt. Co.
Welsbach Street Ltg. Co. of Amer.
Welsbach Co.

Flue Gas Analysis Apparatus
Foxboro Co., Inc.

Furnaces—Gas
See Industrial Fuel.

Gas Analysis Apparatus
Foxboro Co., Inc.
Connelly Iron Sponge & Gov. Co.

Gas Irons
Crane Co., Wm. M.

Gas Plants, Complete
Davis & Farnum Mfg. Co.
Russell Engineering Co.
Stacey Bros. Gas Constr. Co.
Stacey Manufacturing Co., The.
Western Gas Construction Co.

Gas Pumps & Boosters
Connersville Blower Co.
Roots Co., P. H. & F. M.

Gas Stoves
Crane Co., Wm., M.

Gauges
Pressure Recording
American Meter Co.
Brown Instrument Co.
Foxboro Co., Inc., The.
Helme & McIlhenny.
McDonald & Co., D.
Connelly Iron Sponge & Gov. Co.
Syphon
American Meter Co., Inc.

Governors
Chaplin-Fulton Mfg. Co.
Connelly Iron Sponge & Gov. Co.
Davis & Farnum Mfg. Co.
Gas Machinery Co.,
Helme & McIlhenny.
Isbell-Porter Co.
Pittsburgh Meter Co.
Reynolds Gas Regulator Co.
Sprague Meter Co.
Western Gas Construction Co.
Automatic
Connelly Iron Sponge & Gov. Co.
Fuel Gas
Connelly Iron Sponge & Gov. Co.

Heaters
General Gas Light Co.
See Ranges. Water Heaters.

Heating Machines
American Gas Furnace Co.

High Pressure Goods
American Gas Furnace Co.
See Governors.

Holders
Bartlett-Hayward Co.
Cruse-Kemper Co.
Davis & Farnum Mfg. Co.
Deily & Fowler Mfg. Co.
Riter-Conley Mfg. Co.
Stacey Bros. Gas Constr. Co.
Stacey Manufacturing Co., The.
Western Gas Construction Co.
Wood & Co., R. D.

Hydrogen Gas Apparatus
Improved Equipment Co.
Western Gas Construction Co.
Foxboro Co., Inc.

Industrial Fuel Appliances
American Gas Furnace Co.
Surface Combustion Co.

Instruments
Recording
American Meter Co.
Brown Instrument Co.
Foxboro Co., Inc., The.

Iron Hydroxide
Iron Hydroxide Co.

Iron Sponge
Connelly Iron Sponge & Gov. Co.

Iron Work
Cruse-Kemper Co.
Davis & Farnum Mfg. Co.
Gas Machinery Co.
Riter-Conley Mfg. Co.
Stacey Bros. Gas Constr. Co.
Stacey Manufacturing Co., The.
Western Gas Construction Co.
Wood & Co., R. D.

Laboratories
Chemical Service Laboratories.
Electrical Testing Laboratories.

Lamps
Crane Co., Wm. M.
General Gas Light Co.
Miner, Thos. T. W.
Pennsylvania Globe Gas Light Co.
Welsbach Co.
Welsbach Street Lighting Co.

Lamp Posts
Donaldson Iron Co.
General Gas Light Co.
Miner, Thos. T. W.
Pennsylvania Globe Gas Light Co.
Welsbach Street Lighting Co.
Western Gas Construction Co.
Wood & Co., R. D.

Lead
United Lead Co.

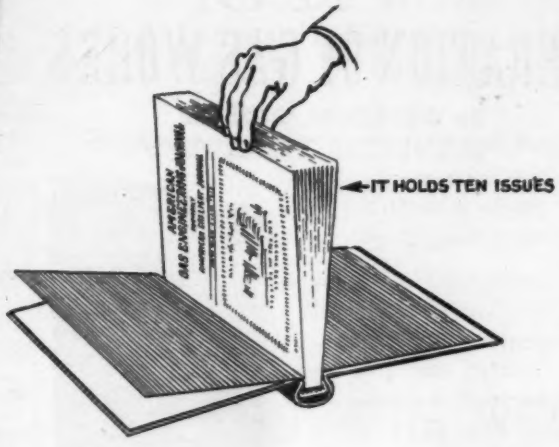
Liquid Lever Gages
Foxboro Co., Inc.

Machinery
See Backfillers.
Charging Machinery.
Coal Gas Apparatus.
Conveyors.
Trench Machinery.
Water Gas Apparatus.

Mains
Sullivan Bros.
See Pipe. Lead.

Mantles
General Gas Light Co.
Miner, Thos. T. W.
Wiederhold Mantle & Burner Co.
Welsbach Street Ltg. Co. of Amer.
Welsbach Co.

Meters
Acetylene
Pittsburgh Meter Co.
Sprague Meter Co.
Air
Pittsburgh Meter Co.
United Gas Improvement Co.
Artificial Gas
Maryland Meter Works.
Complaint
Maryland Meter Works.
Dry
American Meter Co., Inc.
Locks
See Prepayment.
Natural Gas
Maryland Meter Works.
Pittsburgh Meter Co.
Sprague Meter Co.
Prepayment
American Meter Co., Inc.
Griffin & Co., John J.
Helme & McIlhenny.
Maryland Meter Works.
McDonald & Co., D.
Pittsburgh Meter Co.
Sprague Meter Co.
Proportional
Pittsburgh Meter Co.
Regular
American Meter Co., Inc.
Griffin & Co., John J.
Helme & McIlhenny.
Maryland Meter Works.
McDonald & Co.
Pittsburgh Meter Co.
Sprague Meter Co.
Station
American Meter Co., Inc.
Griffin & Co., John J.
Helme & McIlhenny.
Maryland Meter Works.
McDonald & Co.
Steam
Gas Machinery Co.
United Gas Improvement Co.



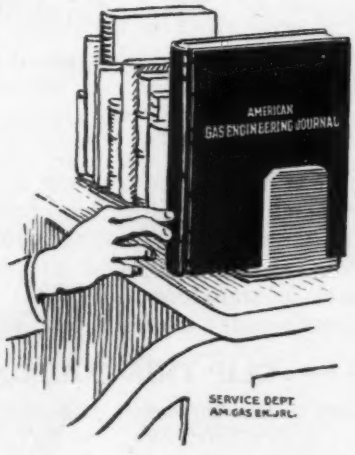
Snap the "JOURNAL" Into this Binder

You will find it easy to slip your copy of the AMERICAN GAS ENGINEERING JOURNAL into this handy binder each week.

Just bend back the cover and the strong, stiff spring takes its grip.

It does away with the ordinary slipshod method of letting the JOURNALS collect in dusty piles, only to get lost or torn.

It's good looking, too. You can put it right on the shelf with the best of your reference books.



A Gas Encyclopaedia Up-to-date —at Your Right Hand

With your JOURNALS in such an accessible form you can refer to that doubtful question quickly. The article is right there, whether you read it two, three or ten weeks ago. An office time-saver—write for it to-day.

Price Postpaid $1.00

American Gas Engineering Journal

42 Pine Street, New York

At last—a really useful book on Gas Works Operation and Management

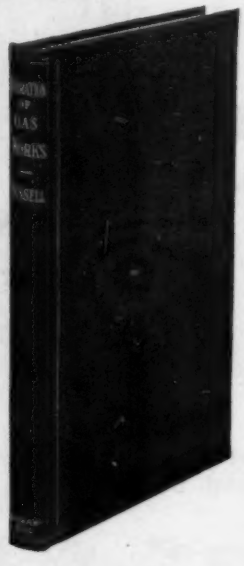
NOW READY

OPERATION OF GAS WORKS

By WALTER M. RUSSELL

Manager, Emporia Gas Company; Member American Gas Institute and National Commercial Gas Association

206 pages, 6 x 9,
76 illustrations,
$2.00 net, postpaid.



The details of gas works operation and management are treated in a concise and practical way in this book. It is the first to cover both coal and water gas manufacture from the standpoint of American practice.

The book has been written for the foreman, superintendent, engineer and others connected with small or medium sized gas works.

The author has had a broad, practical experience in the management of this class of works, and has been a close observer and student of the methods of other plants. He embodies in this book the results of this experience and study, confining himself strictly to methods which have been applied successfully on a commercial scale.

The fundamental aim of the work is to give the manager, superintendent and foreman a better understanding of the manufacturing problem as a whole, and to place at their disposal a knowledge of what others with problems similar to their own, are doing.

-CLIP THIS COUPON-

AMERICAN GAS ENGINEERING JOURNAL,
42 Pine Street, New York, N. Y.

Please send me postpaid one "Operation of Gas Works," by Walter M. Russell, for which I enclose herewith $2.00.

Name .....

Address .....

What Advertisers Offer to Readers

See Index page 18 for Manufacturers' Advertisements of Products Listed here

Western Gas Construction Co.

Test

American Meter Co., Inc.
Maryland Meter Works.
Pittsburgh Meter Co.
Sprague Meter Co.

Wet

American Meter Co., Inc.
Helme & McIlhenny.
Pittsburgh Meter Co.

Motion Recorder

Foxboro Co., Inc.

Outdoor Lighting Fixtures

See Street Lamps.
Lamp Posts.

Ovens

Gas

H. Koppers Co.
Gas Machinery Co.

Oxide

Iron

Henry Bower Chem. Mfg. Co.
Connelly Iron Sponge & Gov. Co.

Paints

Dixon Crucible Co., Jos.

Photometers

American Meter Co., Inc.

Plants—Complete

See Engineers—Contracting.

Pipe

Cast Iron Pipe
Publicity Bureau.
American Cast Iron Pipe Co., The
Clow & Sons, James B.
Davis & Farnum Mfg. Co.
Donaldson Iron Co.
Glamorgan Pipe & Foundry Co.
Lynchburg Foundry Co.
Massillon Iron & Steel Co.
U. S. Cast Iron Pipe & Foundry Co.
Warren Foundry & Machine Co.
Wood & Co., R. D.

Laying

Sullivan Bros.
United Lead Co.

Vises

J. H. Williams & Co.

Columns

Cruse-Kemper Co.

Planemeter

Radial

Foxboro Co., Inc.

Plate

Metal

Stacey Mfg. Co.
Cruse-Kemper Co.,
Riter-Conley Co.

Prepayment Meters

See Meters.

Processes

See Coal Gas Apparatus.
Water Gas Apparatus.
Hydrogen Gas Apparatus.

Producer Gas Plants

Gas Machinery Co.
Western Gas Construction Co.
Wood & Co., R. D.

Provers—Meter

American Meter Co., Inc.
Helme & McIlhenny.
Maryland Meter Works.
McDonald & Co., D.
Pittsburgh Meter Co.

Pumps

Drip

American Meter Co., Inc.
Connersville Blower Co.

Purifiers

Bartlett-Hayward Co.
Cruse-Kemper Co.
Davis & Farnum Mfg. Co.
Gas Machinery Co.
Isbell-Porter Co.
Parker-Russell Min. & Mfg. Co.
Stacey Bros. Gas Constr. Co.
Stacey Manufacturing Co., The
United Gas Improvement Co.
Western Gas Construction Co.
Wood & Co., R. D.

Purifying Materials

Connelly Iron Sponge & Gov. Co.
Gas Machinery Co.
Iron Hydroxide Co.
Pennsylvania Salt Mfg. Co.
United Gas Improvement Co.
Western Gas Construction Co.

Purifier Trays

Connelly Iron Sponge & Gov. Co.
Davis & Farnum Mfg. Co.
Iron Hydroxide Co.
Western Gas Construction Co.

Pyrometers

Brown Instrument Co.
Foxboro Co., Inc., The.

Ranges—Gas

Crane Co., Wm. M.

Red Ore

Connelly Iron Sponge & Gov. Co.
Pennsylvania Mfg. Co.

Regulators

See Governors.

Retorts

Horizontal and Inclined

Didier-March Co.
Gardner, Jr., Co., James.
Gas Machinery Co.
Gautier & Co., J. H.
Improvement Equipment Co.
Isbell-Porter Co.
Maurer & Son, H.
Missouri Fire Brick Co.
Parker-Russell Mining & Manufacturing Co.
Russell Engineering Co.
Stacey Bros. Gas Constr. Co.
United Gas Improvement Co.

Silica & Clay

Gardner Co., James.
Gautier & Co., J. H.
Improved Equipment Co.
Parker-Russell Min. & Mfg. Co.
Russell Engineering Co.

Vertical

Isbell-Porter Co.
United Gas Improvement Co.

Rubber Goods

See also Bags.

Services

Sullivan Bros.
See also Pipe.

Scrubbers

See Purifiers.

Scrubber Trays

See Purifier Trays.

Specials

See Pipe.

Steel Construction

See Iron Work.

Stoking Machinery

See Charging Machinery.

Stoppers

Gas Main

Safety Gas Main Stopper Co.

Storage Tanks

See Holders.

Street Lamps

Miner, Thos. T. W.
Pa. Globe Gas Lt. Co.
Welsbach Street Lighting Co.

Structural Iron Work

See Iron Work.

Tachometers

Foxboro Co., Inc.

Tanks

Cruse-Kemper Co.
Bartlett-Hayward Co.
Stacey Mfg. Co.
Davis-Farnum Co.
Delly & Fowler Mfg. Co.
Wood & Co., R. D.
Riter-Conley Co.

Tar Extractors

See Coal Gas Apparatus.
Water Gas Apparatus.

Temperature Controlling Device

American Gas Furnace Co.
Foxboro Co., Inc.

Thermometers

American Meter Co.
Brown Instrument Co.
Connelly Iron Sponge & Gov. Co.
Foxboro Co., Inc., The.
Gas Machinery Co.

Time Recorder

Foxboro Co., Inc.

Tools

Connelly Iron Sponge & Gov. Co.,
J. H. Williams & Co.
Safety Gas Main Stopper Co.

Towers

Cruse-Kemper Co.

Trench Machinery

Parsons Co., The.

Valves

Bartlett-Hayward Co.
Connelly Iron Sponge & Gov. Co.

What Advertisers Offer to Readers

(*Continued*)

Davis & Farnum Mfg. Co.
Gas Machinery Co.
Isbell-Porter Co.
Ludlow Valve Mfg. Co.
Roots Co., P. H. & F. M.
Stacey Bros. Gas Constr. Co.
Stacey Manufacturing Co., The.
Western Gas Construction Co.
Wood & Co., R. D.

Back Pressure

Connelly Iron Sponge & Gov. Co.

Vertical Retorts

See Retorts.

Washers

See Purifiers.

Water Gas Apparatus

Bartlett-Hayward Co.
Connelly Iron Sponge & Gov. Co.
Davis-Farnum Co.
Didier-March Co.
Gas Machinery Co.
Isbell-Porter Co.
Stacey Manufacturing Co., The.
United Gas Improvement Co.
Western Gas Construction Co.

Water Gas Linings

Crane Co., Wm. M.
Russell Engineering Co.

Water Heaters

Crane & Co., Wm. M.
Russell Engineering Co.

Wrenches

J. H. Williams & Co.

No. 150 LAMP

"THE MINER"
Globe Street Lamps
FOR
ALL KINDS OF GAS OR BURNERS
Lamp Posts, Cocks and Burners
Everything Necessary for
STREET LIGHTING

This cut shows our No. 150 LAMP, which is but one of a large variety of designs
If you are interested in street or park lighting, we want to send you our catalog and prices

Thos. T. W. Miner
819-823 Eagle Ave., New York, N.Y.

THE MARYLAND METER

"B" METERS

For Increased Capacity under Slow Speed Operation

ARTIFICIAL AND NATURAL GAS METERS, PREPAYMENT METERS, STATION METERS, METER PROVERS, COMPLAINT METERS, &c. SPECIAL ATTENTION TO REPAIR WORK

MARYLAND METER WORKS

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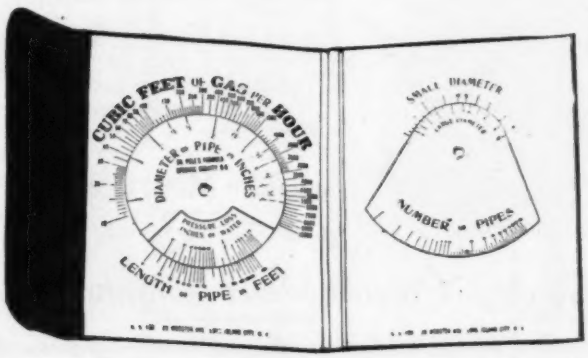

Fox Gas Flow Computer

For Superintendents, Salesmen, Foremen and Fitters

TO DETERMINE THE PROPER SIZE OF PIPE TO SPECIFY OR INSTALL AS RUNNING LINES, SERVICES, AND FOR CONNECTIONS TO APPLIANCES AND METERS.

The "Gas Flow" Computer on the left of the folder has the following ranges:

Cu. ft. of gas per hour.....from 10 to 10,000 cu. ft.
Diameter of pipe.....from ⅜ to 6 inches.
Length of pipe.....from 10 to 1,000 feet.
Pressure loss.....from 0.01 to 1 in. water.
Specific Gravity—0.6.

The Computer on right of the folder affords a rapid means of determining the number of pipes that can be taken from one of a larger diameter, and have an equivalent capacity. It also can be used to determine the size of pipe necessary to supply a number of small pipes of the same, or varied diameters. It may be used to design headers for meters and appliances, when the distances between the outlets are small enough to make the loss of pressure negligible.

The Computer is issued in pocket size, mounted in a neatly bound folder, measuring 4½ inches by 6 inches, containing an insert page of directions.

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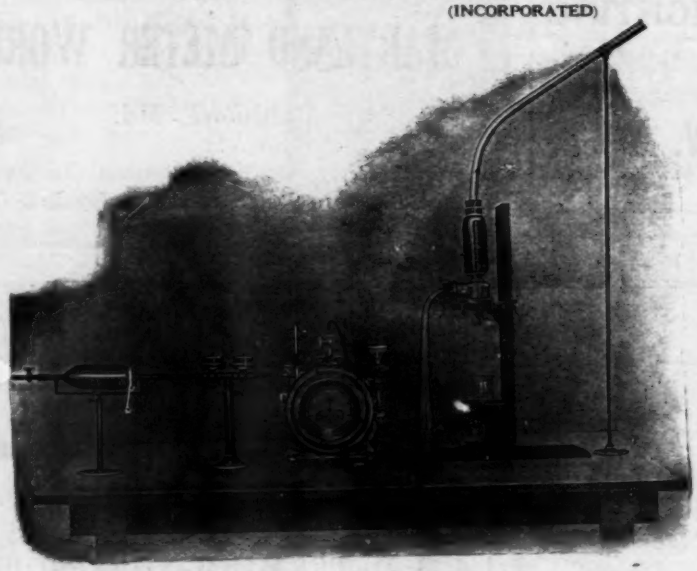

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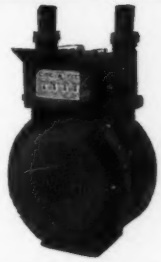

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